Dell™ PowerEdge™ T410 Systems

Hardware Owner's Manual

DELL™

Notes, Cautions, and Warnings

NOTE: A NOTE indicates important information that helps you make better use of your computer.

CAUTION: A CAUTION indicates potential damage to hardware or loss of data if instructions are not followed.

WARNING: A WARNING indicates a potential for property damage, personal injury, or death.

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1

About Your System

Accessing System Features During Startup

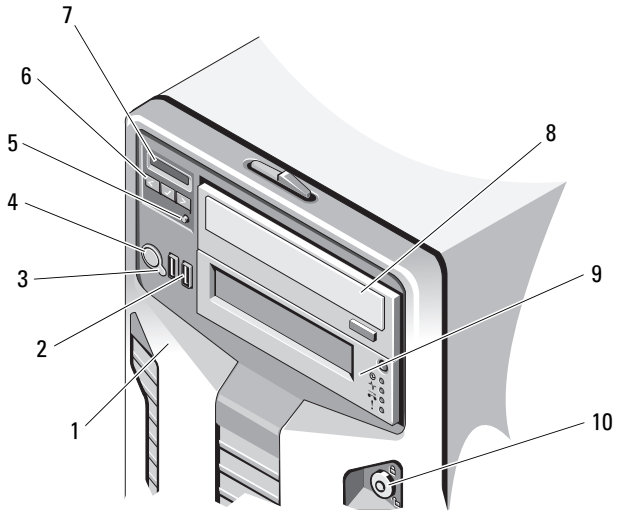
The following keystrokes provide access to system features during startup.

Keystroke	Description
<F2>	Enters the System Setup program. See "Using the System Setup Program and UEFI Boot Manager" on page 61.
<F10>	Enters System Services, which opens the Unified Server Configurator. The Unified Server Configurator allows you to access utilities such as embedded system diagnostics. For more information, see the Unified Server Configurator documentation.
<F11>	Enters the BIOS Boot Manager or the UEFI Boot Manager, depending on the system's boot configuration. See "Using the System Setup Program and UEFI Boot Manager" on page 61.
<F12>	Starts PXE boot.
<Ctrl+E>	Enters the Baseboard Management Controller (BMC) or iDRAC Configuration Utility, which allows access to the system event log (SEL) and configuration of remote access to the system. For more information, see the BMC or iDRAC user documentation.
<Ctrl+C>	Enters the SAS Configuration Utility. For more information, see the SAS adapter documentation.
<Ctrl+R>	Enters the PERC configuration utility. For more information, see the PERC card documentation.
<Ctrl+S>	Enters the utility to configure NIC settings for PXE boot. For more information, see the documentation for your integrated NIC.

Front-Panel Features and Indicators

NOTE: Depending on the configuration, your system may have an LCD panel or LED diagnostic indicators. The illustration in this section shows a system with an LCD panel.

Figure 1-1. Front Panel Features and Indicators



Item	Indicator, Button, or Connector	Icon	Description
1	Front bezel		Covers the system's front-loading hard drives.
2	USB connectors (2)		Connects USB devices to the system. The ports are USB 2.0-compliant.

Item	Indicator, Button, or Connector	Icon	Description
3	NMI button		Used to troubleshoot software and device driver errors when using certain operating systems. This button can be pressed using the end of a paper clip. Use this button only if directed to do so by qualified support personnel or by the operating system's documentation.
4	Power-on indicator, power button		The power-on indicator lights when the system power is on. The power button controls the DC power supply output to the system. **NOTE:** When powering on the system, the video monitor can take up to 25 seconds to display an image, depending on the amount of memory installed in the system. **NOTE:** On ACPI-compliant operating systems, turning off the system using the power button causes the system to perform a graceful shutdown before power to the system is turned off. **NOTE:** To force an ungraceful shutdown, press and hold the power button for five seconds.
5	System identification button		The identification button on the front panel can be used to locate a particular system. When the button is pushed, the LCD panel on the front flashes blue until the button is pushed again.
6	LCD menu buttons		Allows you to navigate the control panel LCD menu.

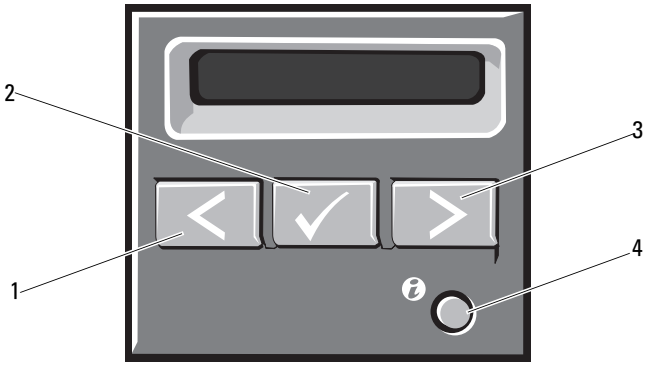
Item	Indicator, Button, or Connector	Icon	Description
7	LED or LCD panel		**NOTE:** Depending on the configuration, your system may have either an LCD panel or LED diagnostic indicators. LED panel — The four diagnostic indicator lights display error codes during system startup. See "Diagnostic Lights (Optional)" on page 26. LCD panel — Provides system ID, status information, and system error messages. The LCD lights blue during normal system operation. The LCD lights amber when the system needs attention, and the LCD panel displays an error code followed by descriptive text. **NOTE:** If the system is connected to AC power and an error has been detected, the LCD lights amber regardless of whether the system has been powered on.
8	Optical drive (optional)		One or two optional SATA DVD-ROM or DVD+RW drives. **NOTE:** DVD devices are data only.
9	Tape drive (optional)		One optional half-height (using one drive bay) or full-height drive (using two drive bays).
10	Front bezel lock		Secures the front bezel to the system.

LCD Panel Features (Optional)

The system's LCD panel provides system information and status and error messages to signify when the system is operating correctly or when the system needs attention. See "LCD Status Messages (Optional)" on page 27 for information about specific status codes.

The LCD backlight lights blue during normal operating conditions and lights amber to indicate an error condition. When the system is in standby mode, the LCD backlight is off and can be turned on by pressing the Select button on the LCD panel. The LCD backlight will remain off if LCD messaging is turned off through the BMC or iDRAC utility, the LCD panel, or other tools.

Figure 1-2. LCD Panel Features



Item	Buttons	Description
1	Left	Moves the cursor back in one-step increments.
2	Select	Selects the menu item highlighted by the cursor.
3	Right	Moves the cursor forward in one-step increments. During message scrolling: • Press once to increase scrolling speed. • Press again to stop. • Press again to return to default scrolling speed. • Press again to repeat the cycle.
4	System identification	Turns the system ID mode on (LCD panel flashes blue) and off. Press quickly to toggle the system ID on and off. If the system hangs during POST, press and hold the system ID button for more than five seconds to enter BIOS Progress mode.

Home Screen

The Home screen displays user-configurable information about the system. This screen is displayed during normal system operation when there are no status messages or errors present. When the system is in standby mode, the LCD backlight will turn off after five minutes of inactivity if there are no error messages. Press one of the three navigation buttons (Select, Left, or Right) to view the Home screen.

To navigate to the Home screen from another menu, continue to select the up arrow until the Home icon is displayed, and then select the Home icon.

From the Home screen, press the **Select** button to enter the main menu. See the following tables for information on the **Setup** and **View** submenus.

Setup Menu

NOTE: When you select an option in the **Setup** menu, you must confirm the option before proceeding to the next action.

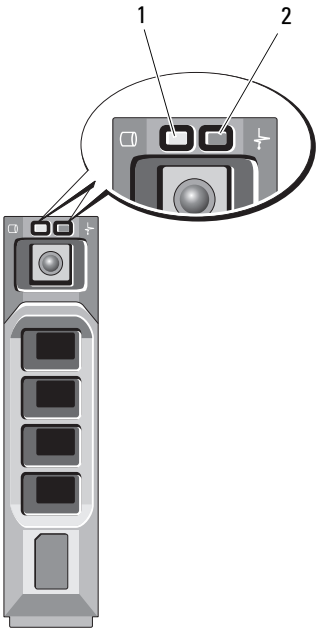
Option	Description
BMC or DRAC **NOTE:** If an iDRAC6 Express card is installed on the system, the BMC option is replaced by DRAC.	Select **DHCP** or **Static IP** to configure the network mode. If **Static IP** is selected, the available fields are **IP**, Subnet (**Sub**), and Gateway (**Gtw**). Select **Setup DNS** to enable DNS and to view domain addresses. Two separate DNS entries are available.
Set error	Select **SEL** to display LCD error messages in a format that matches the IPMI description in the SEL. This can be useful when trying to match an LCD message with an SEL entry. Select **Simple** to display LCD error messages in a simplified user-friendly description. See "LCD Status Messages (Optional)" on page 27 for a list of messages in this format.
Set home	Select the default information to be displayed on the LCD Home screen. See "View Menu" on page 18 to see the options and option items that can be selected to display by default on the Home screen.

View Menu

Option	Description
BMC IP or DRAC IP **NOTE:** If an iDRAC6 Express card is installed on the system, the BMC IP option is replaced by DRAC IP.	Displays the **IPv4** or **IPv6** addresses for the iDRAC6. Addresses include **DNS** (**Primary** and **Secondary**), **Gateway**, **IP**, and **Subnet** (IPv6 does not have Subnet). **NOTE:** BMC IP supports only IPv4 addresses.
MAC	Displays the MAC addresses for **DRAC**, **iSCSI***n*, or **NET***n*. **NOTE:** If the iDRAC Express card is not installed on the system, the MAC option displays the MAC addresses for BMC, iSCSI*n* or NET*n*.
Name	Displays the name of the **Host**, **Model**, or **User String** for the system.
Number	Displays the **Asset tag** or the **Service tag** for the system.
Power	Displays the power output of the system in BTU/hr or Watts. The display format can be configured in the **Set home** submenu of the **Setup** menu. See "Setup Menu" on page 17.
Temperature	Displays the temperature of the system in Celsius or Fahrenheit. The display format can be configured in the **Set home** submenu of the **Setup** menu. See "Setup Menu" on page 17.

Hard-Drive Status Indicators

Figure 1-3. Hard-Drive Indicators



1 drive-activity indicator (green)

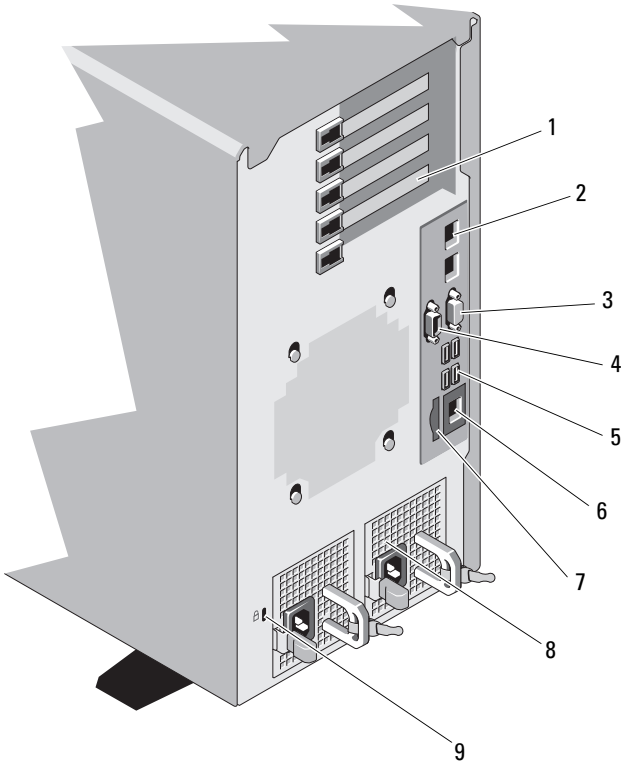
2 drive-status indicator (green and amber)

Drive-Status Indicator Pattern (RAID Only)	Condition
Blinks green two times per second	Identify drive/preparing for removal
Off	Drive ready for insertion or removal **NOTE:** The drive status indicator remains off until all hard drives are initialized after system power is applied. Drives are not ready for insertion or removal during this time.
Blinks green, amber, and off	Drive predicted failure

Drive-Status Indicator Pattern (RAID Only)	Condition
Blinks amber four times per second	Drive failed
Blinks green slowly	Drive rebuilding
Steady green	Drive online
Blinks green three seconds, amber three seconds, and off six seconds.	Rebuild aborted

Back-Panel Features and Indicators

Figure 1-4. Back-Panel Features and Indicators



Item	Indicator, Button, or Connector	Icon	Description
1	PCIe expansion card slots (5)		Connects up to five PCI Express expansion cards. Supports two full-height, full-length (30.99-cm [12.2-in]) cards. Supports three full-height, half-length, cards. Slot 1: PCIe x8 (x4 routing, Gen 2), half-length Slot 2: PCIe x8 (x4 routing, Gen 2), full-length Slot 3: PCIe x8 (x4 routing, Gen 1), full-length Slot 4: PCIe x8 (x4 routing, Gen 2), half-length Slot 5: PCIe x16 (x8 routing, Gen 2), half-length
2	Ethernet connectors (2)		Integrated 10/100/1000 NIC connectors.
3	video connector		Connects a VGA display to the system.
4	serial connector		Connects a serial device to the system.
5	USB connectors (4)		Connects USB devices to the system. The ports are USB 2.0-compliant.
6	iDRAC6 Enterprise port (optional)		Dedicated management port for the optional iDRAC6 Enterprise card.
7	VFlash media slot (optional)		Connects an external SD memory card for the optional iDRAC6 Enterprise card.

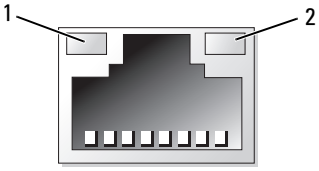
Item	Indicator, Button, or Connector	Icon	Description
8	power supplies (2)		Depending on your configuration, your system may have a redundant power supply or a non-redundant power supply. **NOTE:** The figure shows a system with a redundant power supply. Redundant power supply — 580 W Non-redundant power supply — 525 W
9	security cable slot		Connects a cable lock to the system.

Guidelines for Connecting External Devices

- Turn off power to the system and external devices before attaching a new external device. Turn on any external devices before turning on the system (unless the documentation for the device specifies otherwise).
- Ensure that the appropriate driver for the attached device has been installed on the system.
- If necessary to enable ports on your system, use the System Setup program. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

NIC Indicator Codes

Figure 1-5. NIC Indicator Codes



1 link indicator 2 activity indicator

Indicator	Indicator Code
Link and activity indicators are off	The NIC is not connected to the network.
Link indicator is green	The NIC is connected to a valid network link at 1000 Mbps.
Link indicator is amber	The NIC is connected to a valid network link at 10/100 Mbps.
Activity indicator is green blinking	Network data is being sent or received.

Power Indicator Codes

An LED indicator on the power button provides information on system power status.

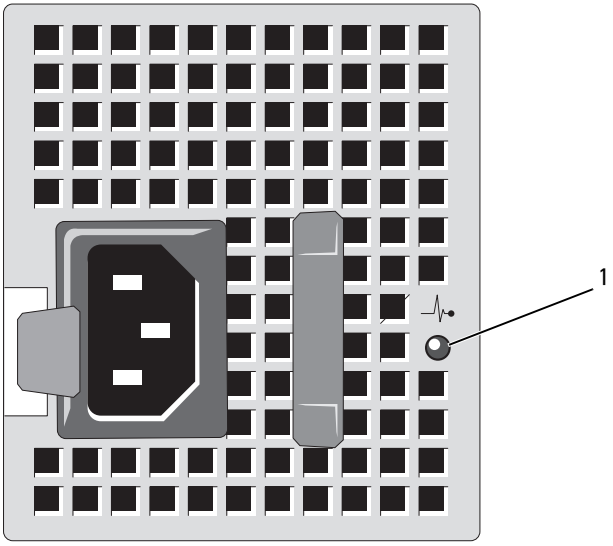
The power supplies have indicators that show whether power is present or whether a power fault has occurred.

- Not lit — AC power is not connected.
- Green — In standby mode, a green light indicates that a valid AC source is connected to the power supply and that the power supply is operational. When the system is on, a green light also indicates that the power supply is providing DC power to the system.

- Amber — Indicates a problem with the power supply.
- Alternating green and amber — When hot-adding a power supply, this indicates that the power supply is mismatched with the other power supply (a high output power supply and an energy smart power supply are installed in the same system). Replace the power supply that has the flashing indicator with a power supply that matches the capacity of the other installed power supply.

CAUTION: When correcting a power supply mismatch, replace only the power supply with the flashing indicator. Swapping the opposite power supply to make a matched pair can result in an error condition and unexpected system shutdown. To change from a High Output configuration to an Energy Smart configuration or vice versa, you must power down the system.

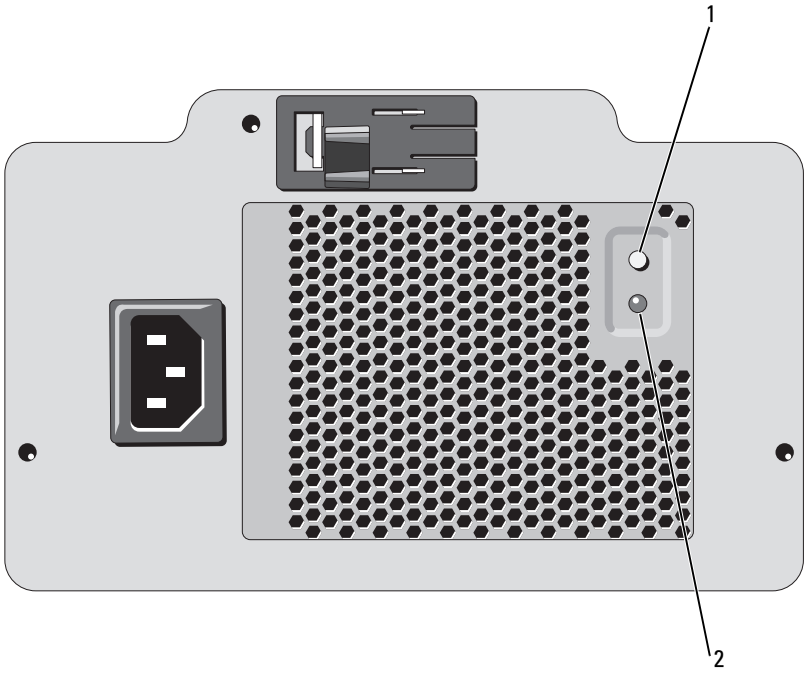
Figure 1-6. Redundant Power Supply Status Indicator



1 power supply status

A non-redundant power supply has an LED indicator that shows whether power is present or whether a power fault has occurred.

Figure 1-7. Non-Redundant Power Supply Status Indicator



1 power supply test switch 2 power supply status

- Not lit — AC power is not connected.
- Green — In standby mode, a green light indicates that a valid AC source is connected to the power supply and that the power supply is operational. When the system is on, a green light also indicates that the power supply is providing DC power to the system.

Diagnostic Lights (Optional)

The four diagnostic indicator lights on the system front panel display error codes during system startup. Table 1-5 lists the causes and possible corrective actions associated with these codes. A highlighted circle indicates the light is on; a non-highlighted circle indicates the light is off.

NOTE: The diagnostic LEDs are not present when the system is equipped with an LCD display.

Table 1-1. Diagnostic Indicator Code

Code	Causes	Corrective Action
	The system is in a normal off condition or a possible pre-BIOS failure has occurred.	Plug the system into a working electrical outlet and press the power button.
	The diagnostic lights are not lit after the system successfully boots to the operating system.	
	The system is in a normal operating condition after POST.	Information only.
	BIOS checksum failure detected; system is in recovery mode.	See "Getting Help" on page 185.
	Possible processor failure.	See "Troubleshooting the Processors" on page 171.
	Memory failure.	See "Troubleshooting System Memory" on page 162.
	Possible expansion card failure.	See "Troubleshooting Expansion Cards" on page 169.
	Possible video failure.	See "Getting Help" on page 185.

Table 1-1. Diagnostic Indicator Code *(continued)*

Code	Causes	Corrective Action
	Hard drive failure.	Ensure that the diskette drive and hard drive are properly connected. See Hard Drives for information on the drives installed in your system.
	Possible USB failure.	See "Troubleshooting a USB Device" on page 156.
	No memory modules detected.	See "Troubleshooting System Memory" on page 162.
	System board failure.	See "Getting Help" on page 185.
	Memory configuration error.	See "Troubleshooting System Memory" on page 162.
	Possible system board resource and/or system board hardware failure.	See "Getting Help" on page 185.
	Possible system resource configuration error.	See "Getting Help" on page 185.
	Other failure.	Ensure that the diskette drive, optical drive, and hard drives are properly connected. See "Troubleshooting Your System" on page 155 for the appropriate drive installed in your system. If the problem persists, see "Getting Help" on page 185.

LCD Status Messages (Optional)

The LCD messages refer to events recorded in the System Event Log (SEL). For information on the SEL and configuring system management settings, see the systems management software documentation.

NOTE: If your system fails to boot, press the System ID button for at least five seconds until an error code appears on the LCD. Record the code, then see "Getting Help" on page 185.

Table 1-2. LCD Status Messages

Code	Text	Causes	Corrective Actions
N/A	*SYSTEM NAME*	*A 62-character string that can be defined by the user in the System Setup program.* The *SYSTEM NAME* displays under the following conditions: • The system is powered on. • The power is off and active errors are displayed.	This message is for information only. You can change the system ID and name in the System Setup program. See "Entering the System Setup Program" on page 62.
E1000	Failsafe voltage error. Contact support.	Check the system event log for critical failure events.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E1114	Ambient Temp exceeds allowed range.	Ambient temperature has a reached a point outside of the allowed range.	See "Troubleshooting System Cooling Problems" on page 161.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E1116	Memory disabled, temp above range. Power cycle AC.	Memory has exceeded allowable temperature and has been disabled to prevent damage to the components.	Remove AC power to the system for 10 seconds and restart the system. See "Troubleshooting System Cooling Problems" on page 161. If the problem persists, see "Getting Help" on page 185.
E1210	Motherboard battery failure. Check battery.	CMOS battery is missing or the voltage is outside of the allowable range.	See "Troubleshooting the System Battery" on page 160.
E1211	RAID Controller battery failure. Check battery.	RAID battery is either missing, bad, or unable to recharge due to thermal issues.	Reseat the RAID battery connector. See "Installing a RAID Battery" on page 120, and "Troubleshooting System Cooling Problems" on page 161.
E1216	3.3V Regulator failure. Reseat PCIe cards.	3.3V voltage regulator has failed.	Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 169.
E1229	CPU # VCORE Regulator failure. Reseat CPU.	Specified processor VCORE voltage regulator has failed.	Reseat the processor(s). See "Troubleshooting the Processors" on page 171. If the problem persists, see "Getting Help" on page 185.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E122A	CPU # VTT Regulator failure. Reseat CPU.	Specified processor VTT voltage regulator has failed.	Reseat the processor(s). See "Troubleshooting the Processors" on page 171. If the problem persists, see "Getting Help" on page 185.
E122C	CPU Power Fault. Power cycle AC.	A power fault was detected when powering up the processor(s).	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E122D	Memory Regulator # Failed. Reseat DIMMs.	One of the memory regulators has failed..	Reseat the memory modules. See "Troubleshooting System Memory" on page 162.
E122E	On-board regulator failed. Call support.	One of the on-board voltage regulators failed.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E1310	Fan ## RPM exceeding range. Check fan.	RPM of the specified fan is outside of the intended operating range.	See "Troubleshooting System Cooling Problems" on page 161.
E1311	Fan module ## RPM exceeding range. Check fan.	RPM of the specified fan in a specified module is outside of intended operating range.	See "Troubleshooting System Cooling Problems" on page 161.
E1313	Fan redundancy lost. Check fans.	The system is no longer fan redundant. Another fan failure would put the system at risk of over-heating.	Check LCD for additional scrolling messages. See "Troubleshooting a Fan" on page 161.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E1410	Internal Error detected. Check "FRU X".	Specified processor has an internal error. The error may or may not have been caused by the processor.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E1414	CPU # temp exceeding range. Check CPU heatsink.	Specified processor is out of acceptable temperature range.	Ensure that the processor heat sinks are properly installed. See "Troubleshooting the Processors" on page 171" and "Troubleshooting System Cooling Problems" on page 161.
E1418	CPU # not detected. Check CPU is seated properly.	Specified processor is missing or bad, and the system is in an unsupported configuration.	Ensure that the specified microprocessor is properly installed. See "Troubleshooting the Processors" on page 171.
E141C	Unsupported CPU configuration. Check CPU or BIOS revision.	Processors are in an unsupported configuration.	Ensure that your processors match and conform to the type described in the processor technical specifications outlined in your system's *Getting Started Guide*.
E141F	CPU # protocol error. Power cycle AC.	The system BIOS has reported a processor protocol error.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E1420	CPU Bus parity error. Power cycle AC.	The system BIOS has reported a processor bus parity error.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E1422	CPU # machine check error. Power cycle AC.	The system BIOS has reported a machine check error.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E1610	Power Supply # (### W) missing. Check power supply.	Specified power supply was removed or is missing from the system.	See "Troubleshooting Power Supplies" on page 161.
E1614	Power Supply # (### W) error. Check power supply.	Specified power supply has failed.	See "Troubleshooting Power Supplies" on page 161.
E1618	Predictive failure on Power Supply # (### W). Check PSU.	An over-temperature condition or power supply communication error has caused the predictive warning of an impending power supply failure.	See "Troubleshooting Power Supplies" on page 161.
E161C	Power Supply # (### W) lost AC power. Check PSU cables.	Specified power supply is attached to the system, but it has lost its AC input.	Check the AC power source for the specified power supply. If the problem persists, see "Troubleshooting Power Supplies" on page 161.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E1620	Power Supply # (### W) AC power error. Check PSU cables.	Specified power supply's AC input is outside of the allowable range.	Check the AC power source for the specified power supply. If the problem persists, see "Troubleshooting Power Supplies" on page 161.
E1624	Lost power supply redundancy. Check PSU cables.	The power supply subsystem is no longer redundant. If the remaining power supply fails, the system will shut down.	See "Troubleshooting Power Supplies" on page 161.
E1626	Power Supply Mismatch. PSU1 = ### W, PSU2 = ### W.	The power supplies in the system are not the same wattage.	Ensure that power supplies with matching wattage are installed. See the Technical Specifications outlined in your system's *Getting Started Guide*.
E1629	Power required > PSU wattage. Check PSU and config.	The system configuration requires more power than the power supplies can provide, even with throttling.	Turn off power to the system, reduce the hardware configuration or install higher-wattage power supplies, and then restart the system.
E1710	I/O channel check error. Review & clear SEL.	The system BIOS has reported an I/O channel check.	Check the SEL for more information and then clear the SEL. Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E1711	PCI parity error on Bus ## Device ## Function ##	The system BIOS has reported a PCI parity error on a component that resides in PCI configuration space at bus ##, device ##, function ##.	Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 169.
	PCI parity error on Slot #. Review & clear SEL.	The system BIOS has reported a PCI parity error on a component that resides in the specified slot.	Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 169.
E1712	PCI system error on Bus ## Device ## Function ##	The system BIOS has reported a PCI system error on a component that resides in PCI configuration space at bus ##, device ##, function ##.	Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 169.
E1714	Unknown error. Review & clear SEL.	The system BIOS has determined there has been an error in the system, but is unable to determine its origin.	Check the SEL for more information and then clear the SEL. Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E171F	PCIe fatal error on Bus ## Device ## Function ##	The system BIOS has reported a PCIe fatal error on a component that resides in PCI configuration space at bus ##, device ##, function ##.	Remove and reseat the PCIe expansion cards. If the problem persists, see "Troubleshooting Expansion Cards" on page 169.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E1810	Hard drive ## fault. Review & clear SEL.	The specified hard drive has experienced a fault.	See "Troubleshooting a Hard Drive" on page 167.
E1812	Hard drive ## removed. Check drive.	The specified hard drive has been removed from the system.	Information only.
E1920	iDRAC6 Upgrade Failed	The iDRAC6 Express card is not installed properly or the card is bad.	Reseat the iDRAC6 Express Card. See "Installing an iDRAC6 Express Card" on page 127. If the problem persists, see "Getting Help" on page 185.
E1A14	SAS cable A failure. Check connection.	SAS cable A is missing or bad.	Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 185.
E1A15	SAS cable B failure. Check connection.	SAS cable B is missing or bad.	Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 185.
E1A1D	Control panel USB cable not detected. Check cable.	USB cable to the control panel is missing or bad.	Reseat the cable. If the problem persists, replace cable. If the problem persists, see "Getting Help" on page 185.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E2010	Memory not detected. Inspect DIMMs.	No memory was detected in the system.	Install or reseat memory modules. See "Installing Memory Modules" on page 110 or "Troubleshooting System Memory" on page 162.
E2011	Memory configuration failure. Check DIMMs.	Memory detected, but is not configurable. Error detected during memory configuration.	See "Troubleshooting System Memory" on page 162.
E2012	Memory configured but unusable. Check DIMMs.	Memory configured, but is unusable.	See "Troubleshooting System Memory" on page 162.
E2013	BIOS unable to shadow memory. Check DIMMs.	The system BIOS failed to copy its flash image into memory.	See "Troubleshooting System Memory" on page 162.
E2014	CMOS RAM failure. Power cycle AC.	CMOS failure. CMOS RAM not functioning properly.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E2015	DMA Controller failure. Power cycle AC.	DMA controller failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E2016	Interrupt Controller failure. Power cycle AC.	Interrupt controller failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E2017	Timer refresh failure. Power cycle AC.	Timer refresh failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E2018	Programmable Timer error. Power cycle AC.	Programmable interval timer error.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E2019	Parity error. Power cycle AC.	Parity error.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E201A	SuperIO failure. Power cycle AC.	SIO failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E201B	Keyboard Controller error. Power cycle AC.	Keyboard controller failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E201C	SMI initialization failure. Power cycle AC.	System management interrupt (SMI) initialization failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E201D	Shutdown test failure. Power cycle AC.	BIOS shutdown test failure.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Getting Help" on page 185.
E201E	POST memory test failure. Check DIMMs.	BIOS POST memory test failure.	See "Troubleshooting System Memory" on page 162. If the problem persists, see "Getting Help" on page 185.
E2020	CPU configuration failure. Check screen message.	Processor configuration failure.	Check screen for specific error messages. See "Troubleshooting the Processors" on page 171.
E2021	Incorrect memory configuration. Review User Guide.	Incorrect memory configuration.	Check screen for specific error messages. See "Troubleshooting System Memory" on page 162.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E2022	General failure during POST. Check screen message.	General failure after video.	Check screen for specific error messages.
E2023	BIOS Unable to mirror memory. Check DIMMs.	The system BIOS could not enable memory mirroring because of a faulty memory module or an invalid memory configuration.	See "Troubleshooting System Memory" on page 162.
E2110	Multibit Error on DIMM ##. Reseat DIMM.	The memory module in slot "##" has had a multi-bit error (MBE).	See "Troubleshooting System Memory" on page 162.
E2111	SBE log disabled on DIMM ##. Reseat DIMM.	The system BIOS has disabled memory single-bit error (SBE) logging and will not log anymore SBEs until the system is rebooted. "##" represents the memory module implicated by the BIOS.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Troubleshooting System Memory" on page 162.
E2112	Memory spared on DIMM ##. Power cycle AC.	The system BIOS has spared the memory because it has determined the memory had too many errors. "##" represents the memory module implicated by the BIOS.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Troubleshooting System Memory" on page 162.

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
E2113	Mem mirror OFF on DIMM ## & ##. Power cycle AC	The system BIOS has disabled memory mirroring because it has determined one half of the mirror has had too many errors. "## & ##" represents the memory-module pair implicated by the BIOS.	Remove AC power to the system for 10 seconds and restart the system. If the problem persists, see "Troubleshooting System Memory" on page 162.
I1910	Intrusion detected. Check chassis cover.	System cover has been removed.	Information only.
I1911	LCD Log Full. Check SEL to review all Errors.	LCD overflow message. A maximum of ten error messages can display sequentially on the LCD. The eleventh message instructs the user to check the SEL for details on the events.	Check the SEL for details on the events. Remove AC power to the system for 10 seconds or clear the SEL.
I1912	SEL full. Review & clear log.	The SEL is full of events and is unable to log any more.	Check the SEL for details on the events, then clear the SEL.
I1920	iDRAC6 Upgrade Successful	iDRAC6 Express card has been installed correctly	Information only
W1228	RAID Controller battery capacity < 24hr.	Warns predictively that the RAID battery has less than 24 hours of charge left.	Allow RAID battery to charge to greater than 24 hours of sustained charge. If problem persists, replace RAID battery. See "Installing a RAID Battery."

Table 1-2. LCD Status Messages *(continued)*

Code	Text	Causes	Corrective Actions
W1627	Power required > PSU wattage. Check PSU and config.	The system configuration requires more power than what the power supply can provide.	Turn off power to the system, reduce the hardware configuration or install higher-wattage power supplies, and then restart the system.
W1628	Performance degraded. Check PSU and system configuration.	The system configuration requires more power than what the power supply can provide, but it can boot if throttled.	Turn off power to the system, reduce the hardware configuration or install higher-wattage power supplies, and then restart the system.

NOTE: For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 187.

Solving Problems Described by LCD Status Messages

The code and text on the LCD can often specify a very precise fault condition that is easily corrected. For example, if the code `E1418 CPU_1_Presence` appears, you know that a microprocessor is not installed in socket 1.

In contrast, you might be able to determine the problem if multiple related errors occur. For example, if you receive a series of messages indicating multiple voltage faults, you might determine that the problem is a failing power supply.

Removing LCD Status Messages

For faults associated with sensors, such as temperature, voltage, fans, and so on, the LCD message is automatically removed when that sensor returns to a normal state. For example, if temperature for a component goes out of range, the LCD displays the fault; when the temperature returns to the acceptable range, the message is removed from the LCD. For other faults, you must take action to remove the message from the display:

- Clear the SEL — You can perform this task remotely, but you will lose the event history for the system.
- Power cycle — Turn off the system and disconnect it from the electrical outlet; wait approximately ten seconds, reconnect the power cable, and restart the system.

Any of these actions will remove fault messages, and return the status indicators and LCD colors to the normal state. Messages will reappear under the following conditions:

- The sensor returns to a normal state but fails again, resulting in a new SEL entry.
- The system is reset and new error events are detected.
- A failure is recorded from another source that maps to the same display entry.

System Messages

System messages appear on the screen to notify you of a possible problem with the system.

NOTE: If you receive a system message not listed in the table, check the documentation for the application that is running when the message appears or the operating system's documentation for an explanation of the message and recommended action.

Table 1-3. System Messages

Message	Causes	Corrective Actions
`128-bit Advanced ECC mode disabled. For 128-bit Advanced ECC, DIMMs must be installed in pairs. Pairs must be matched in size and geometry.`	The Advanced ECC option enabled in BIOS is no longer valid due to an unsupported memory configuration, possibly a faulty or removed memory module. The Advanced ECC setting has been disabled.	Check other messages for a faulty memory module. Reconfigure the memory modules for Advanced ECC mode. See "System Memory" on page 106.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Alert! Advanced ECC Memory Mode disabled! Memory configuration does not support Advanced ECC Memory Mode.`	Advanced ECC Memory Mode was enabled in the system setup program, but the current configuration does not support Advanced ECC Memory Mode. A memory module may be faulty.	Ensure that the memory modules are installed in a configuration that supports Advanced ECC Memory Mode. Check other system messages for additional information for possible causes. For memory configuration information, see "General Memory Module Installation Guidelines" on page 106. If the problem persists, see "Troubleshooting System Memory" on page 162."
`Alert! iDRAC6 not responding. Rebooting.`	The iDRAC6 is not responding to BIOS communication either because it is not functioning properly or has not completed initialization. The system will reboot.	Wait for the system to reboot.
`Alert! iDRAC6 not responding. Power required may exceed PSU wattage.` `Alert! Continuing system boot accepts the risk that system may power down without warning.`	The iDRAC6 has hung. The iDRAC6 was remotely reset while system was booting. After AC recovery, the iDRAC6 takes longer than normal to boot.	Remove AC power to the system for 10 seconds and restart the system.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Alert! Node Interleaving disabled! Memory configuration does not support Node Interleaving.`	The memory configuration does not support node interleaving, or the configuration has changed (for example, a memory module has failed) so that node interleaving cannot be supported. The system continues to run, but without node interleaving.	Ensure that the memory modules are installed in a configuration that supports node interleaving. Check other system messages for additional information for possible causes. For memory configuration information, see "General Memory Module Installation Guidelines" on page 106. If the problem persists, see "Troubleshooting System Memory" on page 162."
`Alert! Power required exceeds PSU wattage. Check PSU and system configuration.` `Alert! Continuing system boot accepts the risk that system may power down without warning.`	The system configuration of processor(s), memory modules, and expansion cards may not be supported by the power supplies.	If any system components were just upgraded, return the system to the previous configuration. If the system boots without this warning, then the replaced component(s) are not supported with this power supply. If Energy Smart power supplies are installed, replace them with High Output power supplies to use the components. See "Power Supplies" on page 121.
`Alert! Redundant memory disabled! Memory configuration does not support redundant memory.`	Memory Sparing or Memory Mirroring was enabled in the system setup program, but the current configuration does not support redundant memory. A memory module may be faulty.	Check the memory modules for failure. See "Troubleshooting System Memory" on page 162. Reset the memory setting, if appropriate. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Alert! System fatal error during previous boot.`	An error caused the system to reboot.	Check other system messages for additional information for possible causes.
`BIOS MANUFACTURING MODE detected. MANUFACTURING MODE will be cleared before the next boot. System reboot required for normal operation.`	System is in manufacturing mode.	Reboot to take the system out of manufacturing mode.
`BIOS Update Attempt Failed!`	Remote BIOS update attempt failed.	Retry the BIOS update. If problem persists, see "Getting Help" on page 185.
`Caution! NVRAM_CLR jumper is installed on system board. Please run SETUP`	NVRAM_CLR jumper is installed in the clear setting. CMOS has been cleared.	Move the NVRAM_CLR jumper to the default position (pins 3 and 5). See Figure 6-1 for jumper location. Restart the system and re-enter the BIOS settings. See "Using the System Setup Program and UEFI Boot Manager" on page 61.
`CPU set to minimum frequency.`	The processor speed may be intentionally set lower for power conservation.	If not an intentional setting, check any other system messages for possible causes.
`CPU x installed with no memory.`	Memory modules are required but not installed in the indicated processor's memory slots.	Install memory modules for the processor. See "System Memory" on page 106.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
CPUs with different cache sizes detected. CPUs with different core sizes detected! System halted CPUs with different logical processors detected! System halted CPUs with different power rating detected! System halted	Mismatched processors have been installed in the system.	Ensure that all processors have the same cache size, number of cores and logical processors, and power rating. Ensure that the processors are properly installed. See "Processors" on page 135.
Current boot mode is set to UEFI. Please ensure compatible bootable media is available. Use the system setup program to change the boot mode as needed.	The system failed to boot because UEFI boot mode is enabled in BIOS and the boot operating system is non-UEFI.	Ensure that the boot mode is set correctly and that the proper bootable media is available. See "Using the System Setup Program and UEFI Boot Manager" on page 61.
Decreasing available memory	Faulty or improperly installed memory modules.	Reseat the memory modules. See "Troubleshooting System Memory" on page 162.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
DIMM configuration on each CPU should match.	Invalid memory configuration on a dual-processor system. The memory module configuration for each processor must be identical.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.
Embedded NIC*x* and NIC*y*: OS NIC=<*ENABLED* | *DISABLED*>, Management Shared NIC= <*ENABLED* | *DISABLED*>	The OS NIC interface is set in BIOS. The Management Shared NIC interface is set in management tools.	Check the system management software or the System Setup program for NIC settings. See "Troubleshooting a NIC" on page 157.
Error 8602 - Auxiliary Device Failure. Verify that mouse and keyboard are securely attached to correct connectors.	Mouse or keyboard cable is loose or improperly connected. Defective mouse or keyboard.	Reseat the mouse or keyboard cable. Ensure that the mouse or keyboard is operational. See "Troubleshooting a USB Device" on page 156.
Gate A20 failure	Faulty keyboard controller; faulty system board.	See "Getting Help" on page 185.
Invalid configuration information - please run SETUP program.	An invalid system configuration caused a system halt.	Run the System Setup program and review the current settings. See "Using the System Setup Program and UEFI Boot Manager" on page 61.
Invalid PCIe card found in the Internal_Storage slot!	The system halted because an invalid PCIe expansion card is installed in the dedicated storage controller slot.	Remove the PCIe expansion card and install the integrated storage controller in the dedicated slot.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
Keyboard fuse has failed	Overcurrent detected at the keyboard connector.	See "Getting Help" on page 185.
Local keyboard may not work because all user accessible USB ports are disabled. If operating locally, power cycle the system and enter system setup program to change settings.	The USB ports are disabled in the system BIOS.	Power down and restart the system from the power button, and then enter the System Setup program to enable the USB port(s). See "Entering the System Setup Program" on page 62.
Manufacturing mode detected	System is in manufacturing mode.	Reboot to take the system out of manufacturing mode.
Maximum rank count exceeded. The following DIMM has been disabled: *x*	Invalid memory configuration. The system will run but with the specified memory module disabled.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.
Memory Initialization Warning: Memory size may be reduced	Invalid memory configuration. The system will run but with less memory than is physically available.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Memory set to minimum frequency.`	The memory frequency may be intentionally set lower for power conservation.	If not an intentional setting, check any other system messages for possible causes.
	The current memory configuration may support only the minimum frequency.	Ensure that your memory configuration supports the higher frequency. See "General Memory Module Installation Guidelines" on page 106.
`Memory tests terminated by keystroke.`	POST memory test was terminated by pressing the spacebar.	Information only.
`MEMTEST lane failure detected on x`	Invalid memory configuration. Mismatched memory modules are installed.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.
`Mirror mode disabled. For mirror mode, DIMMs must be installed in pairs. Pairs must be matched in size and geometry.`	The memory configuration does not match the setting in BIOS. The BIOS setting has been disabled.	Reconfigure the memory modules for Memory Mirroring mode. See "System Memory" on page 106.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`No boot device available`	Faulty or missing optical drive subsystem, hard drive, or hard-drive subsystem, or no bootable USB key installed.	Use a bootable USB key, optical drive, or hard drive. If the problem persists, see "Troubleshooting an Optical Drive" on page 165, "Troubleshooting a USB Device" on page 156, and "Troubleshooting a Hard Drive" on page 167. See "Using the System Setup Program and UEFI Boot Manager" on page 61 for information on setting the order of boot devices.
`No boot sector on hard drive`	Incorrect configuration settings in System Setup program, or no operating system on hard drive.	Check the hard-drive configuration settings in the System Setup program. See "Using the System Setup Program and UEFI Boot Manager" on page 61. If necessary, install the operating system on your hard drive. See your operating system documentation.
`No timer tick interrupt`	Faulty system board.	See "Getting Help" on page 185.
`PCIe Training Error: Expected Link Width is x, Actual Link Width is y.`	Faulty or improperly installed PCIe card in the specified slot.	Reseat the PCIe card in the specified slot number. See "Troubleshooting Expansion Cards" on page 169. If the problem persists, see "Getting Help" on page 185.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Plug & Play Configuration Error`	Error encountered in initializing PCIe device; faulty system board.	Install the NVRAM_CLR jumper in the clear position (pins 1 and 3) and reboot the system. See Figure 6-1 for jumper location. If the problem persists, see "Troubleshooting the Processors" on page 171.
`Quad rank DIMM detected after single rank or dual rank DIMM in socket.`	Invalid memory configuration.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.
`Read fault` `Requested sector not found`	The operating system cannot read from the hard drive, optical drive, or USB device, the system could not find a particular sector on the disk, or the requested sector is defective.	Replace the optical medium, USB medium, or USB device. Ensure that the USB cables, SAS/SATA backplane cables, or optical drive cables are properly connected. See "Troubleshooting a USB Device" on page 156, "Troubleshooting an Optical Drive" on page 165, or "Troubleshooting a Hard Drive" on page 167 for the appropriate drive(s) installed in your system.
`SATA Port x device not found`	There is no device connected to the specified SATA port.	Information only.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions

`Sector not found`
`Seek error`
`Seek operation failed`
	Faulty hard drive, USB device, or USB medium.	Replace the USB medium or device. Ensure that the USB or SAS backplane cables are properly connected. See "Troubleshooting a USB Device" on page 156 or "Troubleshooting a Hard Drive" on page 167 for the appropriate drive(s) installed in your system.

`Shutdown failure`	General system error.	See "Getting Help" on page 185.
`Sparing mode disabled. For sparing mode, matched sets of three must be populated across slots.`	The memory configuration does not match the setting in BIOS. The BIOS setting has been disabled.	Reconfigure the memory modules for Memory Sparing mode. See "System Memory" on page 106.
`The amount of system memory has changed`	Memory has been added or removed or a memory module may be faulty.	If memory has been added or removed, this message is informative and can be ignored. If memory has not been added or removed, check the SEL to determine if single-bit or multi-bit errors were detected and replace the faulty memory module. See "Troubleshooting System Memory" on page 162.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
The following DIMMs should match in geometry: *x,x,...* The following DIMMs should match in rank count: *x,x,...* The following DIMMs should match in size: *x,x,...* The following DIMMs should match in size and geometry: *x,x,...* The following DIMMs should match in size and rank count: *x,x,...*	Invalid memory configuration. The specified memory modules do not match in size, number of ranks, or number of data lanes.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.
Thermal sensor not detected on *x*	A memory module without a thermal sensor is installed in the specified memory slot.	Replace the memory module. See "System Memory" on page 106.
Time-of-day clock stopped	Faulty battery or faulty chip.	See "Troubleshooting the System Battery" on page 160.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Time-of-day not set - please run SETUP program`	Incorrect Time or Date settings; faulty system battery.	Check the Time and Date settings. See "Using the System Setup Program and UEFI Boot Manager" on page 61. If the problem persists, replace the system battery. See "System Battery" on page 139.
`Timer chip counter 2 failed`	Faulty system board.	See "Getting Help" on page 185.
`TPM configuration operation honored. System will now reset.`	A TPM configuration command has been entered. The system will reboot and execute the command.	Information only.
`TPM configuration operation is pending. Press (I) to Ignore OR (M) to Modify to allow this change and reset the system.` `WARNING: Modifying could prevent security.`	This message displays during system restart after a TPM configuration command has been entered. User interaction is required to proceed.	Enter I or M to proceed.
`TPM failure`	A Trusted Platform Module (TPM) function has failed.	See "Getting Help" on page 185.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Unable to launch System Services image. System halted!`	System halted after F10 keystroke because System Services image is either corrupted in the system firmware or has been lost due to system board replacement. The iDRAC6 Enterprise card flash memory may be corrupted.	Restart the system and update the Unified Server Configurator repository to the latest software to restore full functionality. See the Unified Server Configuration user documentation for more information. Restore the flash memory using the latest version on support.dell.com. See the iDRAC6 user's guide for instructions on performing a field replacement of the flash memory.
`Unexpected interrupt in protected mode`	Improperly seated memory modules or faulty keyboard/mouse controller chip.	Reseat the memory modules. See "Troubleshooting System Memory" on page 162. If the problem persists, see "Getting Help" on page 185.
`Unsupported CPU combination` `Unsupported CPU stepping detected`	Processor(s) is not supported by the system.	Install a supported processor or processor combination. See "Processors" on page 135.
`Unsupported DIMM detected. The following DIMM has been disabled: x`	Invalid memory configuration. The system will run but with the specified memory module disabled.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Unsupported memory configuration. DIMM mismatch across slots detected: x,x,...`	Invalid memory configuration. Memory modules are mismatched in the specified slots.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106.
`Unused memory detected. DIMMs installed in the following slot(s) are not available when in Mirror mode`	The memory configuration is not optimal for mirroring or Advanced ECC Memory Mode. Modules in the specified slots are unused.	Reconfigure the memory for Memory Mirroring or Advanced ECC Memory Mode, or change the memory mode to **Optimized** or **Sparing** in the BIOS setup screen. See "System Memory" on page 106.
`Unused memory detected. DIMMs installed in the following slot(s) are not available when in 128-Bit Advanced ECC mode:`	The memory configuration is not optimal for mirroring or Advanced ECC Memory Mode. Modules in the specified slots are unused.	Reconfigure the memory for Memory Mirroring or Advanced ECC Memory Mode, or change the memory mode to **Optimized** or **Sparing** in the BIOS setup screen. See "System Memory" on page 106.
`Warning: A fatal error has caused system reset! Please check the system event log!`	A fatal system error occurred and caused the system to reboot.	Check the SEL for information that was logged during the error. See the applicable troubleshooting section in "Troubleshooting Your System" on page 155 for any faulty components specified in the SEL.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
`Warning: Control Panel is not installed.`	The control panel is not installed or has a faulty cable connection.	Install the control panel, or check the cable connections between the display module, the control panel board, and the system board. See "Control Panel Assembly (Service-Only Procedure)" on page 142.
`Warning! No micro code update loaded for processor n`	Micro code update failed.	Update the BIOS firmware. See "Getting Help" on page 185.
`Warning! Power required exceeds PSU wattage. Check PSU and system configuration.` `Warning! Performance degraded. CPU and memory set to minimum frequencies to meet PSU wattage. System will reboot.`	The system configuration of processor(s), memory modules, and expansion cards may not be supported by the power supplies.	If any system components were just upgraded, return the system to the previous configuration. If the system boots without this warning, then the replaced component(s) are not supported with this power supply. If Energy Smart power supplies are installed, replace them with the High Output power supplies to use the components. See "Power Supplies" on page 121.
`Warning! PSU mismatch. PSU redundancy lost. Check PSU.`	A High Output power supply and an Energy Smart power supply are installed in the system at the same time.	Install two High Output or two Energy Smart power supplies in the system. You can also run the system on one power supply until you can obtain two power supplies of the same type. See "Troubleshooting Power Supplies" on page 161.

Table 1-3. System Messages *(continued)*

Message	Causes	Corrective Actions
Warning! Unsupported memory configuration detected. The memory configuration is not optimal. The recommended memory configuration is: *<message>*	Invalid memory configuration. The system will run but with reduced functionality.	Ensure that the memory modules are installed in a valid configuration. See "General Memory Module Installation Guidelines" on page 106. If the problem persists, see "Troubleshooting System Memory" on page 162.
Write fault Write fault on selected drive	Faulty USB device, USB medium, optical drive assembly, hard drive, or hard-drive subsystem.	Replace the USB medium or device. Ensure that the USB, SAS backplane, or SATA cables are properly connected. See "Troubleshooting a USB Device" on page 156, "Troubleshooting an Optical Drive" on page 165, and "Troubleshooting a Hard Drive" on page 167.

NOTE: For the full name of an abbreviation or acronym used in this table, see the "Glossary" on page 187.

Warning Messages

A warning message alerts you to a possible problem and prompts you to respond before the system continues a task. For example, before you format a diskette, a message will warn you that you may lose all data on the diskette. Warning messages usually interrupt the task and require you to respond by typing y (yes) or n (no).

NOTE: Warning messages are generated by either the application or the operating system. For more information, see the documentation that accompanied the operating system or application.

Diagnostics Messages

The system diagnostic utilities may issue messages if you run diagnostic tests on your system. See "Running the System Diagnostics" on page 173 for more information about system diagnostics.

Alert Messages

Systems management software generates alert messages for your system. Alert messages include information, status, warning, and failure messages for drive, temperature, fan, and power conditions. For more information, see the systems management software documentation.

Other Information You May Need

WARNING: See the safety and regulatory information that shipped with your system. Warranty information may be included within this document or as a separate document.

- The *Getting Started Guide* provides an overview of system features, setting up your system, and technical specifications.
- Any media that ships with your system that provides documentation and tools for configuring and managing your system, including those pertaining to the operating system, system management software, system updates, and system components that you purchased with your system.
- The *Unified Server Configurator User's Guide* provides information about setting up USC, configuring hardware and firmware, and deploying the operating system.

NOTE: Always check for updates on **support.dell.com** and read the updates first because they often supersede information in other documents.

2

Using the System Setup Program and UEFI Boot Manager

Run the System Setup program to familiarize yourself with your system configuration and to:

- Change the NVRAM settings after you add or remove hardware
- Set or change user-selectable options
- Enable or disable integrated devices

Choosing the System Boot Mode

The System Setup program also enables you to specify the boot mode for installing your operating system:

- BIOS boot mode (the default) is the standard BIOS-level boot interface.
- UEFI boot mode is an enhanced 64-bit boot interface based on Unified Extensible Firmware Interface (UEFI) specifications that overlays the system BIOS. See "Entering the UEFI Boot Manager" on page 74 for more information on this interface.

You select the boot mode in the **Boot Mode** field of the "Boot Settings Screen" on page 68 screen of the System Setup program. Once you specify the boot mode, the system boots in the specified boot mode and you proceed then to install your operating system from that mode. Thereafter, you must boot the system to the same boot mode (BIOS or UEFI) to access the installed operating system. Trying to boot the operating system from the other boot mode will cause the system to halt immediately at startup.

NOTE: Operating systems must be UEFI-compatible (for example, Microsoft® Windows Server® 2008 x64 version) to be installed from the UEFI boot mode. DOS and 32-bit operating systems do not support UEFI and can only be installed from the BIOS boot mode.

Entering the System Setup Program

1. Turn on or restart your system.
2. Press <F2> immediately after you see the following message:

   `<F2> = System Setup`

   If your operating system begins to load before you press <F2>, allow the system to finish booting, and then restart your system and try again.

Responding to Error Messages

If an error message appears while the system is booting, make a note of the message. See "System Messages" on page 42 for an explanation of the message and suggestions for correcting errors.

NOTE: After installing a memory upgrade, it is normal for your system to display a message the first time you start your system.

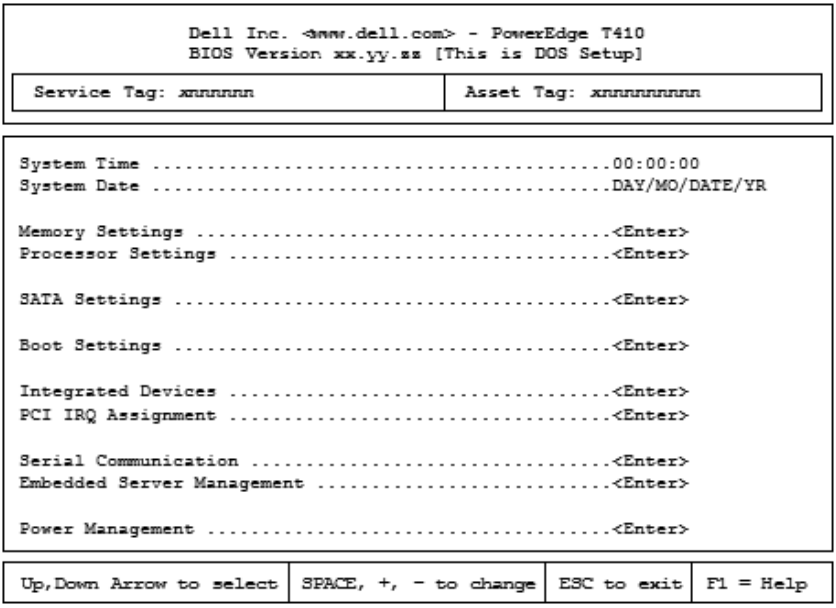
Using the System Setup Program Navigation Keys

Keys	Action
Up arrow or <Shift><Tab>	Moves to the previous field.
Down arrow or <Tab>	Moves to the next field.
Spacebar, <+>, <–>, left and right arrows	Cycles through the settings in a field. In many fields, you can also type the appropriate value.
<Esc>	Exits the System Setup program and restarts the system if any changes were made.
<F1>	Displays the System Setup program's help file.

NOTE: For most of the options, any changes that you make are recorded but do not take effect until you restart the system.

System Setup Options

Main Screen



NOTE: The options for the System Setup program change based on the system configuration.

Option	Description
System Time	Sets the time on the system's internal clock
System Date	Sets the date on the system's internal calendar
Memory Settings	Displays information related to installed memory. See "Memory Settings Screen" on page 65.
Processor Settings	Displays information related to processors (speed, cache, and so on). See "Processor Settings Screen" on page 66.
SATA Settings	Displays a screen to enable or disable the integrated SATA controller and ports. See "SATA Settings Screen" on page 67.

Option	Description
Boot Settings	Displays a screen to specify the boot mode (BIOS or UEFI). For BIOS boot mode, you can also specify the boot devices. See "Boot Settings Screen" on page 68.
Integrated Devices	Displays a screen to enable or disable integrated device controllers and ports, and to specify related features and options. See "Integrated Devices Screen" on page 69.
PCI IRQ Assignment	Displays a screen to change the IRQ assigned to each of the integrated devices on the PCI bus, and any installed expansion card that requires an IRQ. See "PCI IRQ Assignment Screen" on page 70.
Serial Communication	Displays a screen to enable or disable the serial ports and specify related features and options. See "Serial Communication Screen" on page 70.
Embedded Server Management	Displays a screen to configure the front-panel LCD options and to set a user-defined LCD string. See "Embedded Server Management Screen (Optional)" on page 71.
Power Management	Enables you to manage power usage of the processor(s), fans, and memory modules with preconfigured or customized settings. See "Power Management Screen" on page 71.
System Security	Displays a screen to configure the system password and setup password features. See "System Security Screen" on page 72.
Keyboard NumLock (**On** default)	Determines whether your system starts up with the NumLock mode activated on 101- or 102-key keyboards (does not apply to 84-key keyboards).

Option	Description
Report Keyboard Errors (**Report** default)	Enables or disables reporting of keyboard errors during the POST. Select **Report** for host systems that have keyboards attached. Select **Do Not Report** to suppress all error messages relating to the keyboard or keyboard controller during POST. This setting does not affect the operation of the keyboard itself if a keyboard is attached to the system.
F1/F2 Prompt on Error (**Enabled** default)	Enables the system to halt on errors during POST, which allows the user to observe events that may scroll by unnoticed during normal POST. The user can press <F1> to continue or <F2> to enter the System Setup program. **CAUTION: When setting this option to Disabled, the system will not halt if an error occurs during POST. Any critical errors will be displayed and logged in the system event log.**

Memory Settings Screen

Option	Description
System Memory Size	Displays the amount of system memory.
System Memory Type	Displays the type of system memory.
System Memory Speed	Displays the system memory speed.
Video Memory	Displays the amount of video memory.
System Memory Testing (**Enabled** default)	Specifies whether system memory tests are run at system boot. Options are **Enabled** and **Disabled**.

Option	Description
Memory Operating Mode	This field displays the type of memory operation if a valid memory configuration is installed. When set to **Optimizer Mode**, the memory controllers run independently of each other for improved memory performance. When set to **Mirror Mode**, memory mirroring is enabled. When set to **Spare Mode**, memory sparing is enabled. When set to **Advanced ECC Mode**, two controllers are joined in 128-bit mode running multi-bit advanced ECC. For information about the memory modes, see System Memory. **NOTE:** The **Spare Mode** option may not be present on all systems.
Node Interleaving (**Disabled** default)	If this field is **Enabled**, memory interleaving is supported if a symmetric memory configuration is installed. If **Disabled**, the system supports Non-Uniform Memory architecture (NUMA) (asymmetric) memory configurations. **NOTE:** The Node Interleaving field must be set to **Disabled** when using the redundant memory feature.

Processor Settings Screen

Option	Description
64-bit	Specifies if the processors support 64-bit extensions.
Core Speed	Displays the processor clock speed.
Bus Speed	Displays the processor bus speed.
Logical Processor (**Enabled** default)	On processors that support Simultaneous Multi-Threading (SMT) technology, each processor core supports up to two logical processors. If this field is set to **Enabled**, the BIOS reports both logical processors. If set to **Disabled**, only one logical processor is monitored by the BIOS.
Virtualization Technology (**Disabled** default)	**NOTE:** Disable this feature if your system will not be running virtualization software. Enabled permits virtualization software to use the virtualization technology incorporated in the processor.

Option	Description
Execute Disable (**Enabled** default)	Enables or disables execute disable memory protection technology.
Number of Cores per Processor (**All** default)	If set to **All**, the maximum number of cores in each processor is enabled.
Turbo Mode (**Enabled** default)	If Turbo Boost Technology is supported by the processor(s), enables or disables **Turbo Mode**.
C States (**Enabled** default)	When set to **Enabled**, the processor(s) can operate in all available power states
Processor 1 Family -Model-Stepping	Displays the family, model and stepping of the selected processor

SATA Settings Screen

Option	Description
SATA Controller	**ATA Mode** enables the integrated SATA controller. **Off** disables the controller.
Port A (**Auto** default)	**Auto** enables BIOS support for the device attached to SATA port A. **Off** disables BIOS support for the device.
Port B (**Off** default)	**Auto** enables BIOS support for the device attached to SATA port B. **Off** disables BIOS support for the device.
Port C (**Off** default)	**Auto** enables BIOS support for the device attached to SATA port C. **Off** disables BIOS support for the device.
Port D (**Off** default)	**Auto** enables BIOS support for the device attached to SATA port D. **Off** disables BIOS support for the device.
Port E	**Auto** enables BIOS support for the device attached to SATA port E. **Off** disables BIOS support for the device.
Port F	**Auto** enables BIOS support for the device attached to SATA port F. **Off** disables BIOS support for the device.

Boot Settings Screen

Option	Description
Boot Mode (**BIOS** default)	**CAUTION: Switching the boot mode could prevent the system from booting if the operating system was not installed in the same boot mode.** If the system operating system supports Unified Extensible Firmware Interface, you can set this option to **UEFI**. Setting this field to BIOS allows compatibility with non-UEFI operating systems. **NOTE:** Setting this field to UEFI disables the **Boot Sequence**, **Hard-Disk Drive Sequence**, and **USB Flash Drive Emulation Type** fields.
Boot Sequence	If **Boot Mode** is set to **BIOS**, this field provides the location of the operating system files for startup. If **Boot Mode** is set to **UEFI**, you can access the UEFI boot manager utility by rebooting the system and pressing <F11> when prompted to do so.
Hard-Disk Drive Sequence	Determines the order in which the BIOS attempts to boot from hard drives in the system during system startup.
USB Flash Drive Emulation Type (**Auto** default)	Determines the emulation type for a USB flash drive. **Auto** automatically chooses the appropriate emulation type for the device.
Boot Sequence Retry (**Disabled** default)	If this field is **Enabled** and the system fails to boot, the system reattempts to boot after 30 seconds.

Integrated Devices Screen

Option	Description
User Accessible USB Ports (**All Ports On** default)	Enables or disables the user accessible USB ports. Options are **All Ports On**, **Only Back Ports On**, and **All Ports Off**.
Internal USB Port 1 (**On** default)	Enables or disables the internal USB port.
Internal USB Port 2 (**On** default)	Enables or disables the internal USB port.
Embedded NIC1 and NIC2	Enables or disables the operating system interface of the embedded NICs. The NICs may also be accessed through the system's management controller.
Embedded Gb NIC*x* (NIC1 default: **Enabled with PXE**; Other NICs: **Enabled**)	Enables or disables the embedded NIC. Options are **Enabled**, **Enabled with PXE**, and **Enabled with iSCSI Boot**. PXE support allows the system to boot from the network.
MAC Address	Displays the MAC address for the NIC.
OS Watchdog Timer (**Disabled** default)	Sets a timer to monitor the operating system for activity, and aids in recovery if the system stops responding. When **Enabled**, the operating system is allowed to initialize the timer. When **Disabled**, the timer is not initialized. **NOTE:** This feature is usable only with operating systems that support WDAT implementations of the Advanced Configuration and Power Interface (ACPI) 3.0b specification.
I/OAT DMA Engine (**Disabled** default)	Enables or disables the I/O acceleration technology (I/OAT). This feature should only be enabled if the hardware and software support I/OAT.
Embedded Video Controller (**Enabled** default)	Displays the total amount of video memory available in the embedded video controller.

PCI IRQ Assignment Screen

Option	Description
<PCIe device>	Use the <+> and <-> keys to manually select an IRQ for a given device, or select Default to allow the BIOS to select an IRQ value at system startup.

Serial Communication Screen

Option	Description
Serial Communication (**On without Console Redirection** default)	Options are **On without Console Redirection**, **On with Console Redirection via COM1**, **On with Console Redirection via COM2**, and **Off**.
Serial Port Address	Specifies the address of the serial ports
External Serial Connector (**Serial Device1** default)	Specifies whether **Serial Device1**, **Serial Device2**, or **Remote Access Device** has access to the external serial connector.
Failsafe Baud Rate (**115200** default)	Displays the failsafe baud rate used for console redirection. This rate should not be adjusted.
Remote Terminal Type (**VT100/VT220** default)	Options are **VT100/VT220** or **ANSI**.
Redirection After Boot (**Enabled** default)	Enables or disables BIOS console redirection after the operating system boots.

Embedded Server Management Screen (Optional)

Option	Description
Front-Panel LCD Options	Options are **User Defined String**, **Model Number**, and **None**. If the LCD Home screen is set to an option other than these three choices, the option will be displayed as "Advanced" in the BIOS. In this event, the option cannot be changed in the BIOS unless it is changed back to **User Defined String**, **Model Number**, or **None** through another LCD configuration utility (such as the BMC or iDRAC Configuration Utility or the LCD panel menu).
User-Defined LCD String	You can enter a name or another identifier for the system, to be displayed on the LCD module screen.

Power Management Screen

Option	Description
Power Management	Options are **OS Control**, **Active Power Controller**, **Custom**, or **Maximum Performance**. For all but the **Custom** setting, the BIOS pre-configures the power settings on this screen as follows: • **OS Control** sets the CPU power to **OS DBPM**, the fan power to **Minimum Power**, and the memory power to **Maximum Performance**. In this setting, all processor performance information is passed from the system BIOS to the operating system for control. The operating system sets the processor performance based on processor utilization. • **Active Power Controller** sets the CPU power to **System DBPM**, the fan power to **Minimum Power**, and the memory power to **Maximum Performance**. The BIOS sets the processor performance based on processor utilization. • **Maximum Performance** sets all fields to **Maximum Performance**.

Option	Description
CPU Power and Performance Management	Options are **OS DBPM**, **System DBPM**, **Maximum Performance**, or **Minimum Power**.
Fan Power and Performance Management	Options are **Maximum Performance** or **Minimum Power**.
Memory Power and Performance Management	Options are **Maximum Performance**, a specified frequency, or **Minimum Power**.

System Security Screen

Option	Description
System Password	Displays the current status of the password security feature and allows a new system password assignment and verification. **NOTE:** See "Using the System Password" on page 77 for more information.
Setup Password	Restricts access to the System Setup program by using a setup password. **NOTE:** See "Using the System Password" on page 77 for more information.
Password Status (**Unlocked** default)	When **Setup Password** is assigned and this field is **Locked**, the system password cannot be changed or disabled at system start-up. See "Using the System Password" on page 77 for more information.
TPM Security (**Off** default)	Sets the reporting of the Trusted Platform Module (TPM) in the system. If **Off**, the presence of the TPM is not reported to the operating system. If **On with Pre-boot Measurements**, the system reports the TPM to the operating system and stores the pre-boot measurements to the TPM during POST. If **On without Pre-boot Measurements**, the system reports the TPM to the operating system and bypasses pre-boot measurements.

Option	Description
TPM Activation (**No Change** default)	When set to **Activate**, the TPM is enabled to default settings. When set to **Deactivate**, the TPM is disabled. The **No Change** state initiates no action. The operational state of the TPM remains unchanged (all user settings for the TPM are preserved). **NOTE:** This field is read-only when **TPM Security** is set to **Off**.
TPM Clear (**No** default)	**CAUTION: Clearing the TPM will lose all encryption keys in the TPM. This option prevents booting to the operating system and results in data loss if the encryption keys cannot be restored. Back up the TPM keys prior to enabling this option.** When set to **Yes**, all TPM contents are cleared. **NOTE:** This field is read-only when **TPM Security** is set to **Off**.
Power Button (**Enabled** default)	If **Enabled**, the power button can turn the system's power off and on. On an ACPI-compliant operating system, the system performs an orderly shutdown before power is turned off. When **Disabled**, the button can only turn on system power. **NOTE:** You can still turn on the system by using the power button, even if the **Power Button** option is set to **Disabled**.
NMI Button (**Disabled** default)	**CAUTION: Use the NMI button only if directed to do so by qualified support personnel or by the operating system's documentation. Pressing this button halts the operating system and displays a diagnostic screen.** Enables or disables the NMI feature.

Option	Description
AC Power Recovery (**Last** default)	Determines how the system reacts when power is restored. If set to **Last**, the system returns to the last power state. **On** turns on the system after power is restored. **Off** allows the system to remain off after power is restored.
AC Power Recovery Delay (**Immediate** default)	Determines when the system restarts after power is restored. Options are **Immediate**, **Random** (a random value of 30 to 240 seconds), or a user-defined value of 30 to 240 seconds.

Exit Screen

Press <Esc> to exit the System Setup program; the **Exit** screen displays:

- `Save Changes and Exit`
- `Discard Changes and Exit`
- `Return to Setup`

Entering the UEFI Boot Manager

NOTE: Operating systems must be 64-bit UEFI-compatible (for example, Microsoft® Windows Server® 2008 x64 version) to be installed from the UEFI boot mode. DOS and 32-bit operating systems can only be installed from the BIOS boot mode.

NOTE: The Boot Mode must be set to **UEFI** in the System Setup program to access the UEFI Boot Manager.

The UEFI Boot Manager enables you to:

- Add, delete, and arrange boot options
- Access the System Setup program and BIOS-level boot options without rebooting

1. Turn on or restart your system.
2. Press <F11> after you see the following message:

   `<F11> = UEFI Boot Manager`

   NOTE: The system will not respond until the USB keyboard is active.

   If your operating system begins to load before you press <F11>, allow the system to finish booting, and then restart your system and try again.

Using the UEFI Boot Manager Navigation Keys

Keys	Action
Up arrow	Moves to and highlights the previous field.
Down arrow	Moves to and highlights the next field.
Spacebar, <Enter>, <+>, <–>,	Cycles through the settings in a field.
<Esc>	Refreshes the UEFI Boot Manager screen, or returns to the UEFI Boot Manager screen from the other program screens.
<F1>	Displays the UEFI Boot Manager help file.

UEFI Boot Manager Screen

Option	Description
Continue	The system attempts to boot to devices starting with the first item in the boot order. If the boot attempt fails, the system will continue with the next item in the boot order until the boot is successful or no more boot options are found.
<*Boot options*>	Displays the list of available boot options (marked with asterisks). Select the boot option you wish to use and press Enter. **NOTE:** If you hot-add a boot device, press <ESC> to refresh the list of boot options.
UEFI Boot Settings	Enables you to add, delete, enable, or disable boot options; change boot order; or execute a one-time boot option.
System Utilities	Enables you to access the System Setup program, System Services (Unified Server Configurator (USC)), Diagnostics, and BIOS-level boot options.

UEFI Boot Settings Screen

Option	Description
Add Boot Option	Adds a new boot option.
Delete Boot Option	Deletes an existing boot option.
Enable/Disable Boot Option	Disables and enables a boot option in the boot option list.
Change Boot Order	Changes the order of the boot option list.
One-Time Boot From File	Sets a one-time boot option not included in the boot option list.

System Utilities Screen

Option	Description
System Setup	Accesses the System Setup program without rebooting.
System Services (USC)	Restarts the system and accesses the Unified Server Configurator, which allows you to run utilities such as system diagnostics.
BIOS Boot Manager	Accesses the BIOS-level boot options list without rebooting. This option enables you to conveniently switch to BIOS boot mode if you need to boot to a device with a non-UEFI operating system, such as a bootable DOS media with diagnostics software.
Reboot System	Restarts the system.

System and Setup Password Features

NOTE: For a forgotten password, see "Disabling a Forgotten Password" on page 183.

Your system is shipped without the system password feature enabled. Operate the system only with system password protection.

CAUTION: The password features provide a basic level of security for the data on your system.

CAUTION: Anyone can access the data stored on your system if the system is running and unattended.

Using the System Password

When a system password is assigned, the system prompts for the system password after the system starts and only those with the password have full use of the system.

Assigning a System Password

Before assigning a system password, enter the System Setup program and check the **System Password** option.

When a system password is assigned, **System Password** is **Enabled**. If **Password Status** is **Unlocked**, you can change the system password. If **Locked**, you cannot change the system password. Disabling the password jumper on the system board sets **System Password** to **Disabled**, and you cannot change or enter a new system password.

When a system password is not assigned and the password jumper on the system board is in the enabled position, **System Password** is **Not Enabled and Password Status** is **Unlocked**. To assign a system password:

1. Verify that **Password Status** is **Unlocked**.
2. Highlight the **System Password** option and press <Enter>.
3. Type your new system password.

   You can use up to 32 characters in your password.

   As you type, placeholders appear in the field.

   The password assignment is not case-sensitive. Certain key combinations are invalid and if you enter one, the system beeps. To erase a character, press <Backspace> or the left-arrow key.

   NOTE: To escape from the field without assigning a system password, press <Enter> to move to another field, or press <Esc> prior to completing step 5.
4. Press <Enter>.
5. To confirm your password, type it a second time and press <Enter>.

   System Password changes to **Enabled**. Exit the System Setup program and begin using your system.
6. Either reboot the system now for the password protection to take effect or continue working.

   NOTE: Password protection does not take effect until the system reboots.

Using Your System Password to Secure Your System

NOTE: If you have assigned a setup password (see "Using the Setup Password" on page 79), the system accepts your setup password as an alternate system password.

When **Password Status** is **Unlocked**, you have the option to leave the password security enabled or to disable password security.

To leave the password security enabled:

1. Turn on or reboot your system by pressing <Ctrl><Alt><Del>.
2. Type your password and press <Enter>.

To disable the password security:

1. Turn on or reboot your system by pressing <Ctrl><Alt><Del>.
2. Type your password and press <Ctrl><Enter>.

When **Password Status** is **Locked**, you must type the password and press <Enter> when prompted at reboot.

If an incorrect system password is entered, the system displays a message and prompts you to re-enter your password. You have three attempts to enter the correct password. After the third unsuccessful attempt, the system displays an error message that the system has halted and will shut down.

Even after you shut down and restart the system, the error message continues to be displayed until the correct password is entered.

NOTE: You can use the **Password Status** option in conjunction with the **System Password** and **Setup Password** options to protect your system from unauthorized changes.

Deleting or Changing an Existing System Password

1. Press <Ctrl><Enter> at the password prompt to disable the existing system password.

   If you are asked to enter your setup password, contact your network administrator.
2. Enter the System Setup program by pressing <F2> during POST.
3. Select the **System Security** screen to verify that the **Password Status** is **Unlocked**.

4 Type the system password.

5 Confirm that **Not Enabled** is displayed for the **System Password**.

If **Not Enabled** is displayed for the **System Password**, the system password has been deleted. If **Enabled** is displayed for the **System Password**, press the <Alt><b> key combination to restart the system, and repeat step 1 to step 5.

Using the Setup Password

Assigning a Setup Password

You can assign a setup password only when the **Setup Password** is **Not Enabled**. To assign a setup password, highlight the **Setup Password** option and press the <+> or <–> key. The system prompts you to enter and verify the password.

NOTE: The setup password can be the same as the system password. If the two passwords are different, the setup password can be used as an alternate system password. The system password cannot be used in place of the setup password.

You can use up to 32 characters in your password.

As you type, placeholders appear in the field.

The password assignment is not case-sensitive. Certain key combinations are invalid and if you enter one, the system beeps. To erase a character, press <Backspace> or the left-arrow key.

When you verify the password, the **Setup Password** changes to **Enabled**. The next time you enter the System Setup program, the system prompts you for the setup password.

A change to the **Setup Password** option becomes effective immediately (restarting the system is not required).

Operating With a Setup Password Enabled

If **Setup Password** is **Enabled**, you must enter the correct setup password before modifying most of the System Setup options.

If you do not enter the correct password in three attempts, the system lets you view, but not modify, the System Setup screens. The following options are exceptions: If **System Password** is not **Enabled** and is not locked through the **Password Status** option, you can assign a system password. You cannot disable or change an existing system password.

NOTE: You can use the **Password Status** option in conjunction with the **Setup Password** option to protect the system password from unauthorized changes.

Deleting or Changing an Existing Setup Password

1. Enter the System Setup program and select the **System Security**.
2. Highlight **Setup Password**, press <Enter> to access the setup password window. Press <Enter> twice to clear the existing setup password.

   The setting changes to **Not Enabled**.
3. If you want to assign a new setup password, perform the steps in "Assigning a Setup Password."

Embedded System Management

The Unified Server Configurator (USC) is an embedded utility that enables systems and storage management tasks from an embedded environment throughout the server's lifecycle.

The USC can be started during the boot sequence and can function independently of the operating system.

NOTE: Certain platform configurations may not support the full set of features provided by USC.

The following features of USC are supported on systems with Baseboard Management Controller (BMC):

- Installing an operating system
- Running diagnostics to validate the memory, I/O devices, processors, physical disks, and other peripherals

When an optional iDRAC6 Express card is installed, USC provides the following additional features:

- Downloading and applying firmware updates
- Configuring hardware and firmware

For more information about setting up USC, configuring hardware and firmware, and deploying the operating system, see the *Dell Unified Server Configurator User's Guide* on the Dell Support website at **support.dell.com/manuals**.

Baseboard Management Controller Configuration

NOTE: If an iDRAC6 Express card is installed on the system, the Baseboard Management Controller (BMC) utility is replaced by the iDRAC 6 utility.

The BMC enables configuring, monitoring, and recovery of systems remotely. BMC provides the following features:

- Uses the system's integrated NIC
- Enables fault logging and SNMP alerting
- Provides access to system event log and sensor status
- Allows control of system functions including power on and off
- Functions independently of the system's power state or the system's operating system
- Provides text console redirection for system setup, text-based utilities, and operating system consoles

NOTE: To remotely access the BMC through the integrated NIC, you must connect the network connection to integrated NIC1.

For additional information on using BMC, see the documentation for the BMC and systems management applications.

Entering the BMC Setup Module

1. Turn on or restart your system.
2. Press <Ctrl><E> when prompted after POST.

   If your operating system begins to load before you press <Ctrl><E>, allow the system to finish booting, and then restart your system and try again.

iDRAC Configuration Utility

The iDRAC Configuration Utility is a pre-boot configuration environment that allows you to view and set parameters for the iDRAC6 and for the managed server. The iDRAC Configuration Utility enables you to:

- Configure, enable, or disable the iDRAC6 local area network through the dedicated iDRAC6 Enterprise card port or the embedded NICs.
- Enable or disable IPMI over LAN
- Enable a LAN Platform Event Trap (PET) destination
- Attach or detach the Virtual Media devices
- Change the administrative user name and password and manage user privileges
- View System Event Log (SEL) messages or clear messages from the log

For additional information on using iDRAC6, see the documentation for iDRAC6 and systems management applications.

Entering the iDRAC Configuration Utility

1. Turn on or restart your system.
2. Press <Ctrl><E> when prompted during POST.

   If your operating system begins to load before you press <Ctrl><E>, allow the system to finish booting, and then restart your system and try again.

3

Installing System Components

WARNING: While moving or transferring the system, it is recommended that you use the packaging material that shipped with the system and/or take care to avoid any damage due to shock or vibration.

NOTE: Depending on the configuration, your system may have cabled or hot-swappable hard drives, redundant or non-redundant power supplies, and an LCD panel or diagnostic indicators. The illustrations in this section show a system with hot-swappable hard drives and an LCD panel.

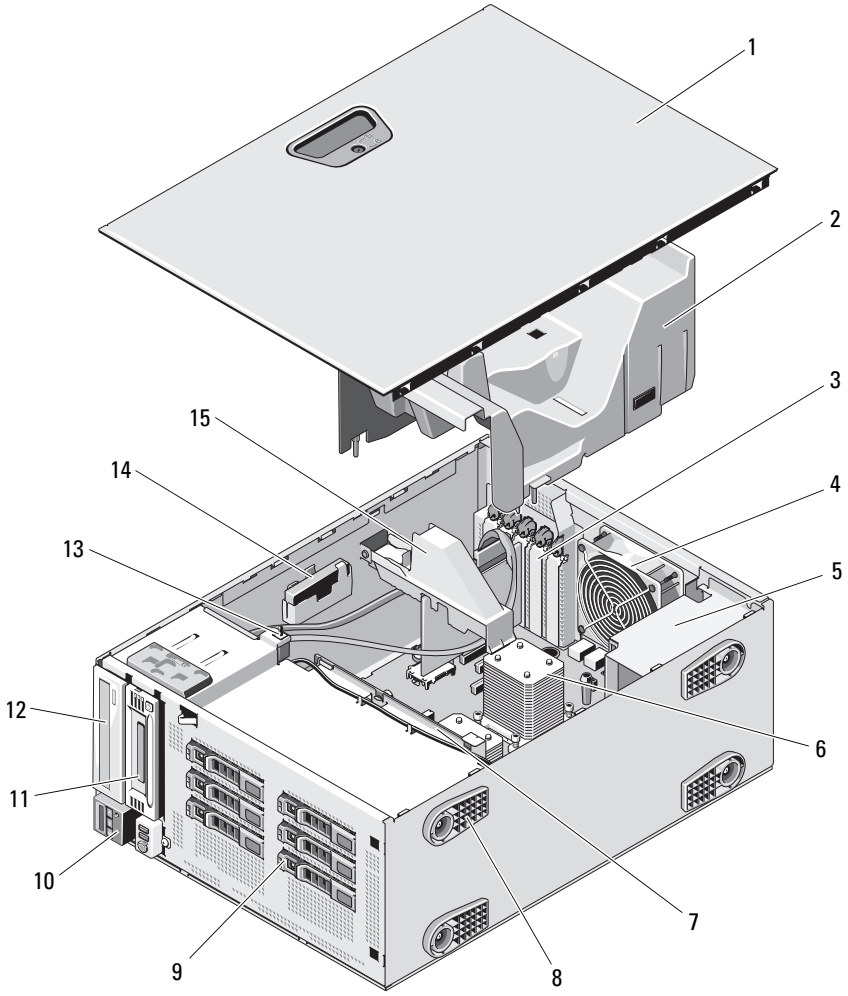
Recommended Tools

- Key to the system keylock
- #1 and #2 Phillips screwdrivers
- Wrist grounding strap

Inside the System

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

Figure 3-1. Inside the System



1	system cover	2	cooling shroud
3	PCIe expansion card slots (5)	4	system fan
5	power supply bay	6	heatsink and processor (1 or 2)
7	SAS backplane	8	system feet (4)
9	SAS or SATA hard drives (up to 6)	10	control panel
11	tape drive (optional)	12	optical drive (optional)
13	chassis intrusion switch	14	RAID battery (optional)
15	expansion card stabilizer		

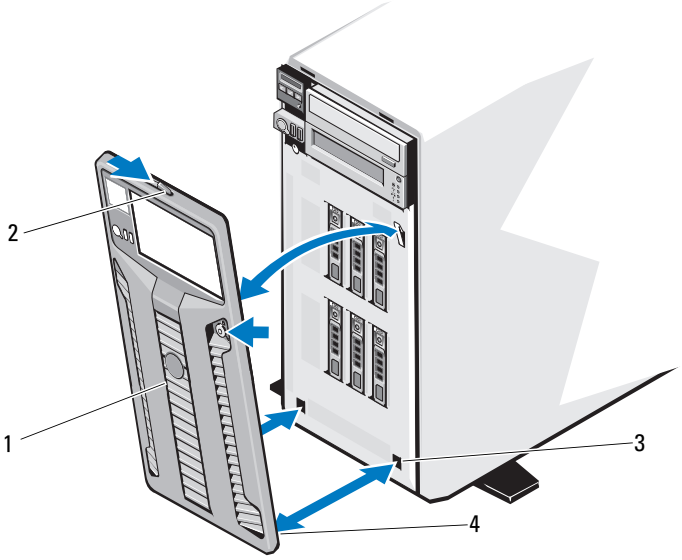
Front Bezel

NOTE: If you are removing or installing a hot-swappable hard drive, the system may remain turned on and in the upright position during removal of the front bezel. If you are removing or installing any other system component(s), the system should be turned off and placed in the orientation shown in Figure 3-1.

Removing the Front Bezel

1. Using the system key, unlock the front bezel (if locked).
2. Slide the release latch in the direction of the arrow and rotate the top end of the bezel away from the chassis.
3. Lift the bezel away from the chassis.

Figure 3-2. Removing and Installing the Front Bezel



1	front bezel	2	release latch
3	bezel tab slots (2)	4	bezel tabs (2)

Installing the Front Bezel

1. Insert the bezel tabs into the bezel tab slots in the chassis. See Figure 3-2.
2. Press the top end of the bezel into the chassis until the lever locks into place.
3. Using the system key, lock the bezel.

Front Bezel Inserts

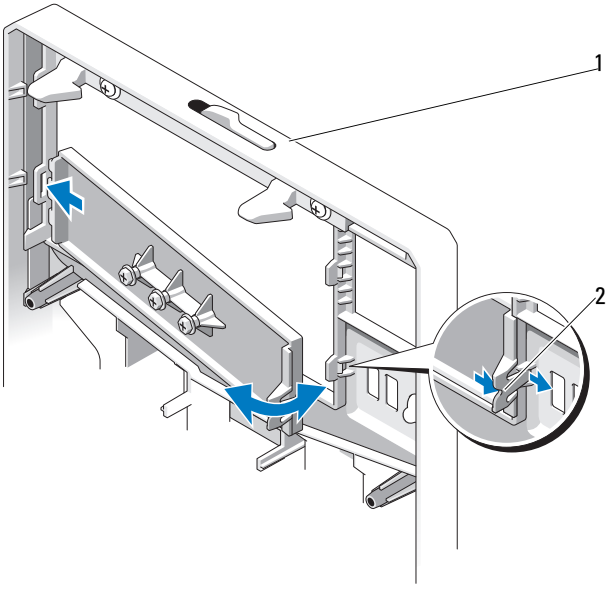
Removing the Front Bezel Insert

NOTE: Before installing a drive in one or more of the front drive bays, first remove the corresponding insert(s) on the front bezel.

NOTE: Bezel inserts may contain screws on the inside. You can attach the screws to new drives, as needed.

1. Remove the front bezel. See "Removing the Front Bezel" on page 85.
2. Press the insert tab and pull the insert away from the bezel. See Figure 3-3.

Figure 3-3. Removing and Installing the Front Bezel Insert



1 front bezel

2 insert tab

Installing the Front Bezel Insert

NOTE: If you remove a drive from one or more of the front drive bays, replace the corresponding insert(s) on the front bezel.

1. From the back of the bezel, align the insert tab with the corresponding notch on the bezel. Press the insert until the tab snaps into place. See Figure 3-3.
2. Replace the front bezel. See "Installing the Front Bezel" on page 86.

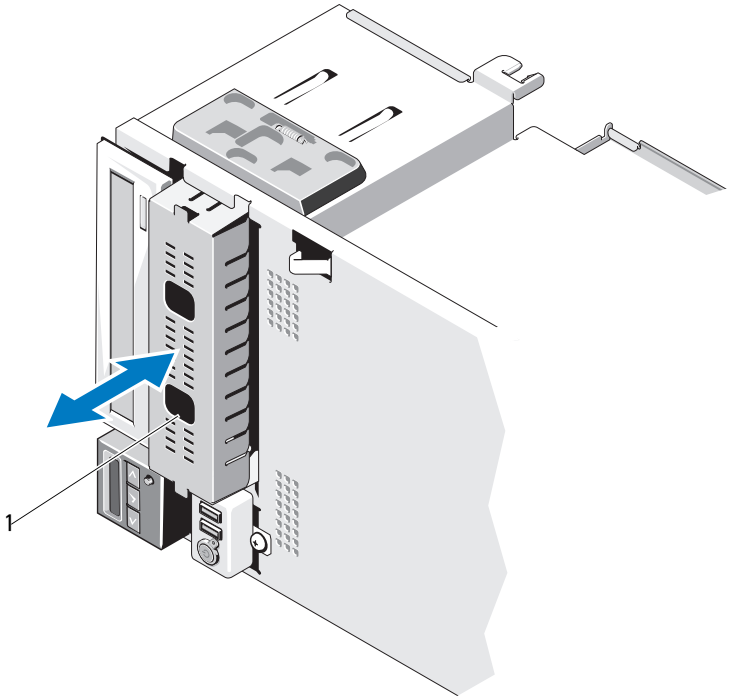
EMI Filler

Depending on the configuration of your system, an EMI filler may be installed in one or more of the 5.25-inch optical drive bays at the front of the system. EMI fillers are essential for airflow efficiency and for electromagnetic interference (EMI) protection. To install an optical drive, the corresponding EMI filler must first be removed.

Removing an EMI Filler

1. Remove the front bezel. See "Removing the Front Bezel" on page 85.
2. Remove the EMI filler out of the chassis by pulling firmly on the holes in the middle of the filler. See Figure 3-4.

Figure 3-4. Removing and Installing an EMI Filler



1 EMI filler

Installing an EMI Filler

1. Push the EMI filler into the empty drive bay on the front of the chassis until the filler locks into place. See Figure 3-4.
2. Replace the front bezel. See "Installing the Front Bezel" on page 86.

Opening and Closing the System

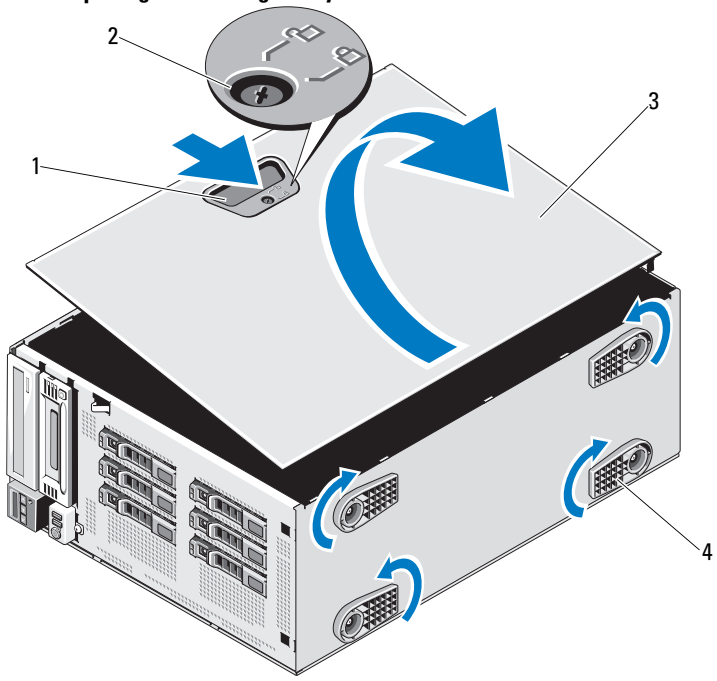
WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

WARNING: Whenever you need to lift the system, get others to assist you. To avoid injury, do not attempt to lift the system by yourself.

Opening the System

1. Unless you are removing a hot-swap component such as a hard drive or a power supply, turn off the system and attached peripherals. Disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface. See Figure 3-5.
3. Turn the lock on the cover release latch counterclockwise to the unlocked position. See Figure 3-5.
4. Pull the cover release latch and rotate the latch towards the back of the system to remove the system cover. See Figure 3-5.
5. Grasp the cover on both sides and carefully lift the cover away from the system. See Figure 3-5.

Figure 3-5. Opening and Closing the System



1	cover release latch	2	cover release latch lock
3	system cover	4	system feet (4)

Closing the System

1. Ensure that all internal cables are connected and folded out of the way.
2. Ensure that no tools or extra parts are left inside the system.
3. Align the cover with the slots in chassis and lower the cover into the chassis. See Figure 3-5.
4. Press the cover into the chassis until the latch locks into place.
5. Turn the lock on the cover release latch clockwise to the locked position. See Figure 3-5.
6. Place the system upright and on its feet on a flat, stable surface.
7. Rotate the system feet outward.

8 Reattach any peripherals and connect the system to an electrical outlet.

9 Turn on the system and attached peripherals.

Cooling Shroud

The cooling shroud directs airflow over the system processor and memory modules.

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

WARNING: The memory modules and heat sink can get very hot during normal operation. Ensure that the memory modules and heat sink have had sufficient time to cool before you touch it.

CAUTION: Never operate your system with the cooling shroud removed. Overheating of the system can develop quickly, resulting in shutdown of the system and loss of data.

Removing the Cooling Shroud

1 Turn off the system and attached peripherals. Disconnect the system from the electrical outlet and periperals.

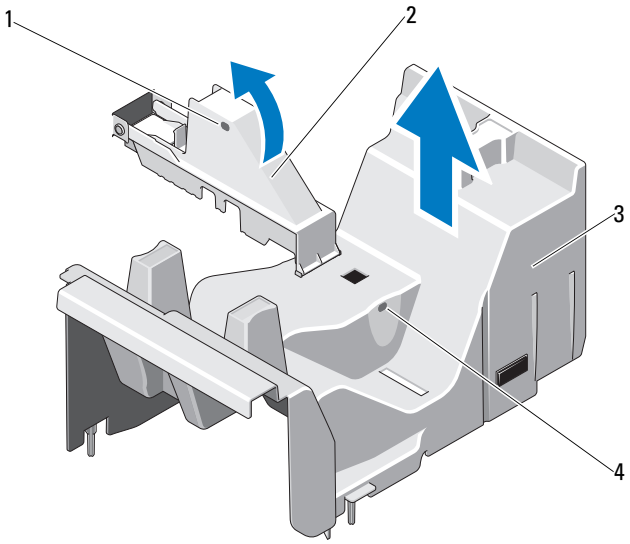
2 Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

4 Hold the touch points on the expansion card stabilizer and lift the expansion card stabilizer away from the cooling shroud. See Figure 3-6.

5 Hold the touch points on the cooling shroud and lift the cooling shroud out of the system. See Figure 3-6.

Figure 3-6. Removing and Installing the Cooling Shroud



1	expansion card stabilizer touch points (2)	2	expansion card stabilizer
3	cooling shroud	4	cooling shroud touch points (2)

Installing the Cooling Shroud

1. Align the cooling shroud with the alignment guides in the system.
2. Hold the touch points on the cooling shroud and carefully lower the cooling shroud into the system. Ensure that no cables are pinned under the edges of the cooling shroud.
3. Hold the touch points and lower the expansion card stabilizer.
4. Close the system. See "Closing the System" on page 91.
5. Place the system upright and on its feet on a flat, stable surface.
6. Rotate the system feet outward.
7. Reattach any peripherals, then connect the system to the electrical outlet.
8. Turn on the system and attached peripherals.

Hard Drives

Your system supports up to six 3.5-inch or 2.5-inch SATA or SAS hard drives. Depending on your chassis, the hard drives are installed internally (see Figure 3-9) or at the front of the system (see Figure 3-7). Internal hard drives are connected to the system board. Front-mounted hard drives are connected to a SAS backplane through hard drive carriers and can be configured as hot-swappable.

Removing a Drive Blank From the Front Bay

CAUTION: To maintain proper system cooling, all empty hard-drive bays must have drive blanks installed.

1. Remove the front bezel. See "Removing the Front Bezel" on page 85.
2. Open the drive blank release handle to release the blank.
3. Slide the drive blank out until it is free of the drive bay.

Installing a Drive Blank in the Front Bay

1. Remove the front bezel. See "Removing the Front Bezel."
2. Open the handle on the drive blank.
3. Insert the drive blank into the drive bay until the blank is fully seated.
4. Close the handle to lock the blank in place.

Removing a Hot-Swap Hard Drive

CAUTION: To prevent data loss, ensure that your operating system supports hot-swap drive removal and installation. See the documentation provided with your operating system for more information.

1. Remove the front bezel. See "Removing the Front Bezel" on page 85.
2. From the RAID management software, prepare the drive for removal. Wait until the hard-drive indicators on the drive carrier signal that the drive can be removed safely. See your controller documentation for information about hot-swap drive removal.

   If the drive has been online, the green activity/fault indicator will flash as the drive is powered down. When the drive indicators are off, the drive is ready for removal.

3 Press the button on the front of the drive carrier to release the carrier handle. See Figure 3-7.

4 Rotate the carrier handle to extract the drive from the bay.

5 Slide the hard drive out until it is free of the drive bay.

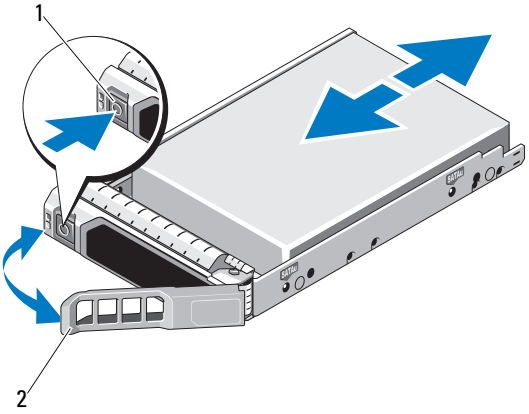
6 Remove the four screws that secure the hard drive to the hard-drive carrier.

7 Remove the hard drive from the carrier.

8 Insert a drive blank in the vacated drive bay. See "Installing a Drive Blank in the Front Bay" on page 94.

CAUTION: To maintain proper system cooling, all empty hard-drive bays must have drive blanks installed.

Figure 3-7. Removing and Installing a Hot-Swap Hard Drive



1 release button

2 hard drive carrier handle

Installing a Hot-Swap Hard Drive

CAUTION: Use only hard drives that have been tested and approved for use with the SAS/SATA backplane.

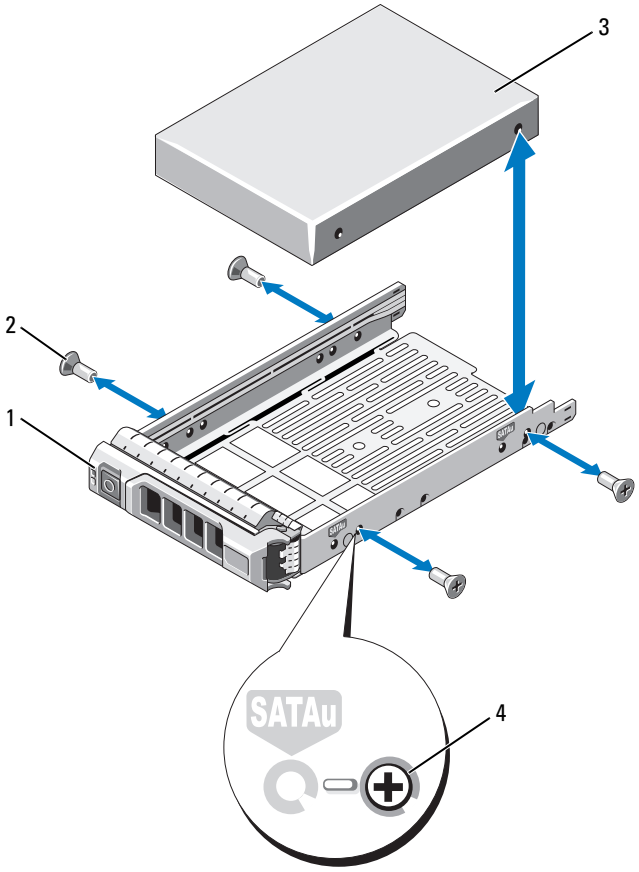
CAUTION: Not all operating systems support hot-swappable hard drive installation. See the documentation supplied with your operating system for more information.

CAUTION: Combining SATA and SAS hard drives in the same system configuration is not supported.

1. Remove the front bezel. See "Removing the Front Bezel" on page 85.
2. Press the button on the front of the drive carrier, rotate the carrier handle outward, and remove the carrier from the drive bay.
3. Install the hard drive carrier on the hard drive.
   a. Insert the hard drive into the hard-drive carrier with the connector end of the drive at the rear. See Figure 3-8.
   b. Align the screw holes on the hard drive with the holes on the hard-drive carrier.

      When aligned correctly, the rear of the hard drive will be flush with the rear of the hard-drive carrier.
   c. Attach the four screws to secure the hard drive to the hard-drive carrier. See Figure 3-8.

Figure 3-8. Installing a Hard Drive Into a Drive Carrier



1	drive carrier	2	screws (4)
3	hard drive	4	SAS/SATA screw hole

4 With the lever on the hard drive carrier open, slide the hard drive into the drive bay until the carrier contacts the backplane. See Figure 3-7.

5 Push in (towards the system) on the hard drive carrier and rotate the handle up until it snaps into place. See Figure 3-7.

6 Replace the front bezel. See "Installing the Front Bezel" on page 86.

Removing a Cabled Hard Drive

WARNING: Only trained service technicians are authorized to remove the system cover and access any components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and from the peripherals.

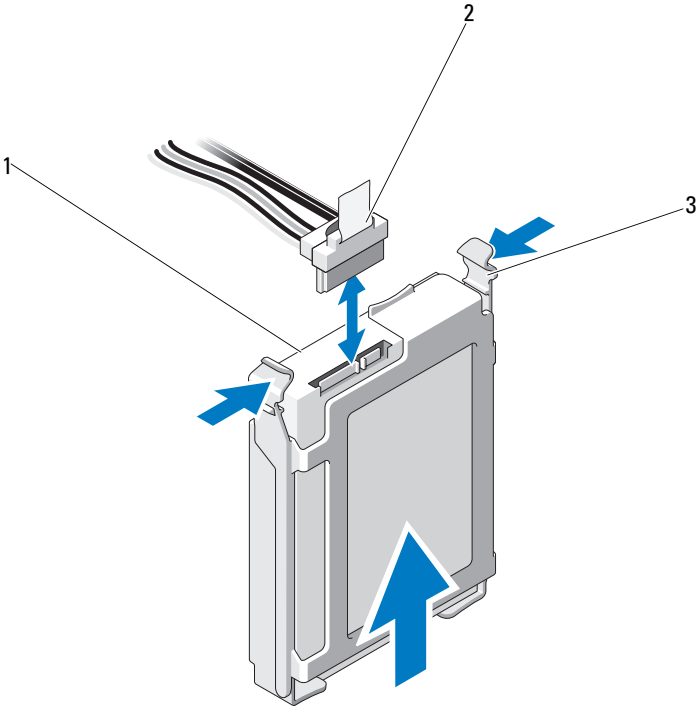
2 Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

4 Disconnect the power and data cable from the hard drive in the drive bay.

5 Press the blue tabs on each side of the hard-drive bracket towards each other and slide the drive up and out of the bay. See Figure 3-9.

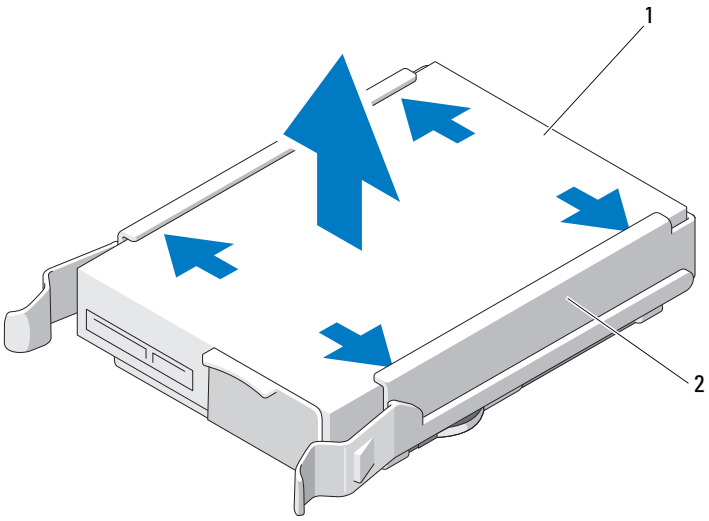
Figure 3-9. Removing and Installing a Cabled Hard Drive



1	hard drive	2	power and data cable
3	blue tabs (2)		

6 Detach the hard-drive bracket from the hard drive by pushing out at the edges of the bracket and removing the hard drive. See Figure 3-10.

Figure 3-10. Removing a Hard Drive From a Hard Drive Bracket



1 hard drive 2 hard drive bracket

NOTE: If you are not replacing the hard drive, remove the drive from the drive bracket (see Figure 3-10) and insert the empty bracket back into the drive bay.

7 Close the system. See "Closing the System" on page 91.

8 Place the system upright and on its feet on a flat, stable surface.

9 Rotate the system feet outward.

10 Reattach any peripherals and connect the system to an electrical outlet.

11 Turn on the system and attached peripherals

Installing a Cabled Hard Drive

WARNING: Only trained service technicians are authorized to remove the system cover and access any components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and from the peripherals.

2 Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

4 To remove the existing hard-drive bracket, press the blue tabs on each side of the bracket towards each other and slide the bracket up and out of the system. See Figure 3-9.

5 Snap the hard-drive bracket onto the hard drive. See Figure 3-10.

6 Slide the hard drive into the drive bay until it snaps into place. See Figure 3-9.

7 Connect the power cable to the hard drive.

8 Connect the data cable to the hard drive and the controller.

- If connecting to the integrated SATA controller (SATA hard drives only), connect the SATA data cable to the SATA_A connector on the system board. See Figure 6-1.
- If connecting to a SAS RAID controller card (SAS or SATA hard drives), connect the data cable to the connector on the card edge. For information on installing a SAS controller card, see "Installing an Expansion Card" on page 115.

9 Close the system. See "Closing the System" on page 91.

10 Place the system upright and on its feet on a flat, stable surface.

11 Rotate the system feet outward.

12 Reconnect the system to the electrical outlet and turn on the system and attached peripherals.

13 Enter the System Setup program and ensure that the hard drive's controller is enabled. See "Entering the System Setup Program" on page 62.

14 Exit the System Setup program and reboot the system.

See the documentation that came with the hard drive for instructions on installing any software required for drive operation.

Optical and Tape Drives

The 5.25-inch drive bays at the front of your system provide support for an optical drive and either an optional tape drive or a second optical drive.

Removing an Optical or a Tape Drive

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

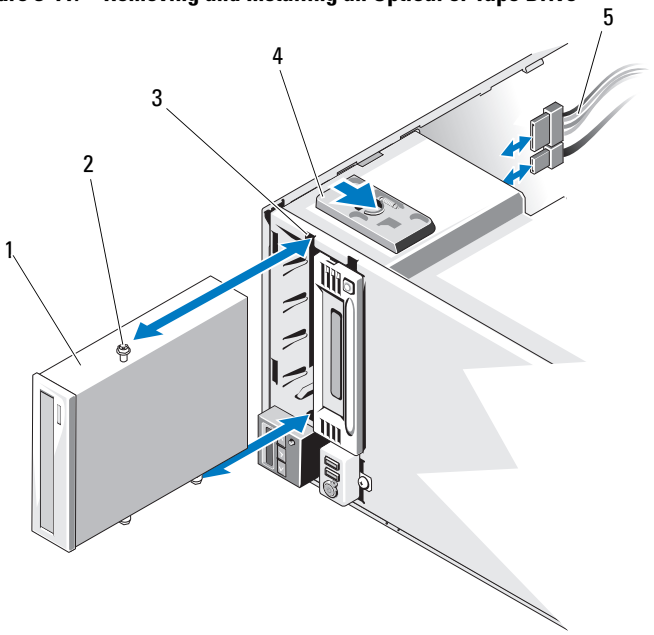
1. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
2. Remove the front bezel. See "Removing the Front Bezel" on page 85.
3. Rotate the system feet inward and lay the system on a flat surface.
4. Open the system. See "Opening the System" on page 90.
5. Disconnect the power and data cables from the back of the drive. See Figure 3-12.
6. Slide the drive release latch in the direction of the arrow to release the shoulder screw and then slide the drive out of the bay. See Figure 3-12
7. If you are installing another drive in the bay, see "Installing an Optical or Tape Drive" on page 103.

   If the drive is being permanently removed:

   a. Install an EMI filler into the empty drive bay. See "Installing an EMI Filler" on page 89.

   b. Install a front bezel insert in the front bezel. See "Installing the Front Bezel Insert" on page 88.
8. Close the system. See "Closing the System" on page 91.
9. Place the system upright and on its feet on a flat, stable surface.
10. Rotate the system feet outward.
11. Replace the front bezel. See "Installing the Front Bezel" on page 86.
12. Reattach any peripherals and connect the system to an electrical outlet.
13. Turn on the system and attached peripherals.

Figure 3-11. Removing and Installing an Optical or Tape Drive



1	optical drive	2	shoulder screws (3)
3	drive bay screw slots	4	drive release latch
5	power and data cables		

Installing an Optical or Tape Drive

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Unpack and prepare the drive for installation. For instructions, see the documentation that accompanied the drive.

If you are installing a SAS tape drive, you must have an internal SAS expansion card installed. See "Installing an Expansion Card" on page 115. Tape drives cannot be connected to the integrated storage controller card.

If you are installing a SCSI tape drive, you must have a SCSI controller card installed. See "Installing an Expansion Card" on page 115. You must

configure the tape drive according to the documentation that came with the tape drive, based on the following guidelines:

a Each device attached to a SCSI host adapter must have a unique SCSI ID number (narrow SCSI devices use IDs 0 to 7; wide SCSI devices use IDs from 0 to 15). Set the drive's SCSI ID to avoid conflicts with other devices on the SCSI bus. For the default SCSI ID setting, see the documentation provided with the drive.

NOTE: There is no requirement that SCSI ID numbers be assigned sequentially or that devices be attached to the cable in order by ID number.

b SCSI logic requires that the two devices at opposite ends of a SCSI chain be terminated and that all devices in between be unterminated. Enable the tape drive's termination if it is the last device in a chain of devices (or sole device) connected to the SCSI controller.

2 Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

3 Open the system. See "Opening the System" on page 90.

4 Remove the front bezel. See "Removing the Front Bezel" on page 85.

5 If you are installing a drive into an empty bay:

a Remove the EMI filler. See "Removing an EMI Filler" on page 88.

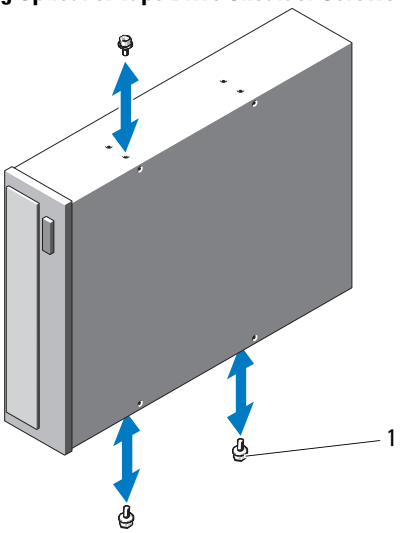
b Remove the front bezel insert. See "Removing the Front Bezel Insert" on page 87.

If you are installing a new drive into a bay that has an optical or a tape drive, see "Removing an Optical or a Tape Drive" on page 102.

6 Attach the three shoulder screws to the drive, one screw on the lower front screw hole on the right side and two screws on the lower screw holes on the left side. See Figure 3-12.

NOTE: If the optical or tape drive you are installing does not have shoulder screws, remove the three shoulder screws from the old drive or the back of the 5.25-inch front bezel insert.

Figure 3-12. Installing Optical or Tape Drive Shoulder Screws



1 shoulder screws (3)

7 From the front of the system, align the shoulder screws with the slots in the chassis and slide the drive into the drive bay until the shoulder screws snap into place. See Figure 3-11.

8 Attach the power and data cables to the drive.

9 Replace the front bezel. See "Installing the Front Bezel" on page 86.

10 Close the system. See "Closing the System" on page 91.

11 Place the system upright and on its feet on a flat, stable surface.

12 Rotate the system feet outward.

13 Reattach any peripherals and connect the system to an electrical outlet.

14 Turn on the system and attached peripherals.

15 Test the drive by running system diagnostics (optional). See "Running the System Diagnostics" on page 173.

System Memory

Your system supports DDR3 registered memory modules (RDIMMs) or ECC unbuffered memory modules (UDIMMs). Single and dual-rank memory modules can be 1067- or 1333-MHz, and quad-rank memory modules can be 1067-MHz.

The system contains eight memory sockets split into two sets of four sockets, one set per each processor. Each four-socket set is organized into two DIMMs for channel 0 and a single DIMM for channel 1 and channel 2. The first socket of each channel is marked with white release levers.

The maximum memory that is supported on your system varies according to the types and sizes of memory modules being used:

- Single-rank and dual-rank RDIMMs of sizes 2-GB, 4-GB, and 8-GB (when available) are supported for a total of up to 64 GB.
- Quad-rank RDIMMs are supported for a total of up to 64 GB.
- 1-GB and 2-GB UDIMMs are supported for a total of up to 16 GB.

General Memory Module Installation Guidelines

To ensure optimal performance of your system, observe the following general guidelines when configuring your system memory.

NOTE: Memory configurations that fail to observe these guidelines can prevent your system from starting or producing any video output.

- RDIMMs and UDIMMs cannot be mixed.
- Except for memory channels that are unused, all populated memory channels must have identical configurations.
- In a dual-processor configuration, the memory configuration for each processor must be identical.
- Memory modules of different sizes can be mixed within a memory channel (for example, 2-GB and 4-GB), but all populated channels must have identical configurations. This applies to only channel 0.
- For Optimizer Mode, memory modules are installed in the numeric order of the sockets beginning with A1 or B1.

- For Memory Mirroring or Advanced ECC Mode, the socket furthest from the processor is unused and memory modules are installed beginning with socket A1 or B1 and proceeding with socket A2 or B2.
- Advanced ECC Mode requires memory modules that use x4 or x8 DRAM device widths.
- The memory speed of each channel depends on the memory configuration:
  - For single or dual-rank memory modules:
    - One memory module per channel supports up to 1333 MHz.
    - Two memory modules per channel supports up to 1067 MHz.
  - For quad-rank memory modules:
    - One memory module per channel supports up to 1067 MHz.
    - Two memory modules per channel are limited to 800 MHz, regardless of memory module speed.
- If quad-rank memory modules are mixed with single- or dual-rank modules, the quad-rank modules must be installed in the sockets with the white release levers.
- If memory modules with different speeds are installed, they will operate at the speed of the slowest installed memory module(s).

Mode-Specific Guidelines

Three memory channels are allocated to each processor. The number of channels and allowable configurations depend on the memory mode selected.

Advanced ECC (Lockstep) Mode Support

In this configuration, the two channels closest to the processor are combined to form one 128-bit channel. This mode supports SDDC for both x4- and x8-based memory modules. Memory modules must be identical in size, speed, and technology in corresponding slots.

Memory Mirroring Support

The system supports memory mirroring if identical memory modules are installed in the two channels closest to the processor (memory should not be installed in the farthest channel). Mirroring must be enabled in the System Setup program. In a mirrored configuration, the total available system memory is one-half of the total installed physical memory.

Optimizer (Independent Channel) Mode

In this mode, all three channels are populated with identical memory modules. This mode permits a larger total memory capacity but does not support SDDC with x8-based memory modules.

A minimal single-channel configuration of one 1-GB memory module per processor is also supported in this mode.

Table 3-1 and Table 3-2 show sample memory configurations that follow the appropriate memory guidelines stated in this section. The samples show identical memory-module configurations and their the physical and available memory totals. The tables do not show mixed or quad-rank memory-module configurations, nor do they address the memory speed considerations of any configuration.

Table 3-1. Sample RDIMM Single- and Dual-Rank Memory Configurations (Per Processor)

Memory Mode	Memory Module Size	Memory Sockets				Single Processor		Dual Processor	
		4	1	2	3	Physical Memory (GB)	Available Memory (GB)	Physical Memory (GB)	Available Memory (GB)
Optimizer	1-GB		X			1	all	2	all
			X	X		2		4	
			X	X	X	3		6	
		X	X			2		4	
		X	X	X	X	4		8	

Table 3-1. Sample RDIMM Single- and Dual-Rank Memory Configurations (Per Processor) *(continued)*

Memory Mode	Memory Module Size	Memory Sockets				Single Processor		Dual Processor	
		4	1	2	3	Physical Memory (GB)	Available Memory (GB)	Physical Memory (GB)	Available Memory (GB)
	2-GB		X			2	all	4	all
			X	X		4		8	
			X	X	X	6		12	
		X	X			4		8	
		X	X	X	X	8		16	
	4-GB		X			4	all	8	all
			X	X		8		16	
			X	X	X	12		24	
		X	X			8		16	
		X	X	X	X	16		32	
	8-GB[1]		X			8	all	16	all
			X	X		16		32	
			X	X	X	24		48	
		X	X			16		32	
		X	X	X	X	32		64	
Advanced ECC[2]	2-GB		X	X		4	all	8	all
	4-GB		X	X		8	all	16	all
	8-GB[1]		X	X		16	all	32	all
Mirroring	2-GB		X	X		4	2	8	4
	4-GB		X	X		8	4	16	8
	8-GB[1]		X	X		16	8	32	16

1. When available.
2. Requires x4- or x8-based memory modules.

Table 3-2. Sample UDIMM Memory Configurations (Per Processor)

Memory Mode	Memory Module Size	Memory Sockets				Single Processor		Dual Processor	
		4	1	2	3	Physical Memory (GB)	Available Memory (GB)	Physical Memory (GB)	Available Memory (GB)
Optimizer	1-GB		X			1	all	2	all
			X	X		2		4	
			X	X	X	3		6	
		X	X	X	X	4		8	
	2-GB		X			2	all	4	all
			X	X		4		8	
			X	X	X	6		12	
		X	X	X	X	8		16	
Advanced ECC[1]	1-GB		X	X		2	all	4	all
	2-GB		X	X		4	all	8	all
Mirroring	1-GB		X	X		2	1	4	2
	2-GB		X	X		4	2	8	4

1. Requires x4- or x8-based memory modules.

Installing Memory Modules

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

WARNING: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components on the memory module.

CAUTION: To ensure proper system cooling, memory-module blanks must be installed in any memory socket that is not occupied. Remove memory-module blanks only if you intend to install memory in those sockets.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

4 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

5 Locate the memory module sockets. See Figure 6-1.

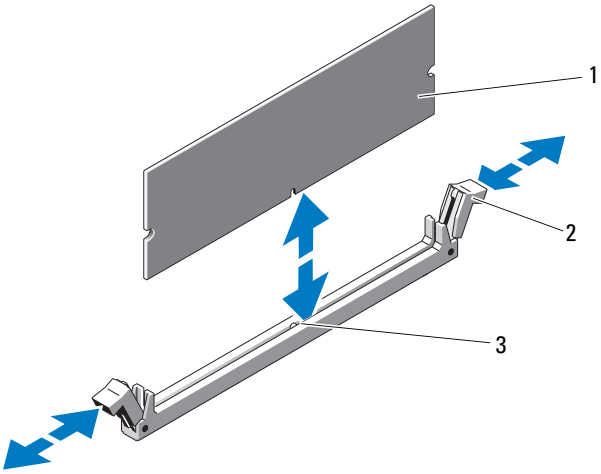
6 Remove the memory-module blanks from the sockets in which you plan to install memory modules:

Press out the ejectors on each end of the socket until the memory-module blank pops out of the socket. See Figure 3-13.

NOTE: Make sure to retain any removed memory-module blanks for future use.

7 Handle each memory module only on either card edge, ensuring not to touch the middle of the memory module.

Figure 3-13. Installing and Removing a Memory Module



1 memory module

2 memory module socket ejectors (2)

3 alignment key

8 Align the memory module's edge connector with the alignment key of the memory module socket, and insert the memory module in the socket.

NOTE: The memory module socket has an alignment key that allows you to install the memory module in the socket in only one way.

9 Press down on the memory module with your thumbs until the socket levers latch into a locked position.

When the memory module is properly seated in the socket, the levers on the memory module socket align with the levers on the other sockets that have memory modules installed.

10 Repeat step 6 through step 9 of this procedure to install the remaining memory modules. See Table 3-1 or Table 3-2.

11 Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.

12 Close the system. See "Closing the System" on page 91.

13 Place the system upright and on its feet on a flat, stable surface.

14 Rotate the system feet outward.

15 Reattach any peripherals and connect the system to an electrical outlet.

16 Turn on the system and attached peripherals.

17 Press <F2> to enter the System Setup program, and check the **System Memory** setting on the main System Setup screen.

The system should have already changed the value to reflect the newly installed memory.

18 If the value is incorrect, one or more of the memory modules may not be installed properly. Repeat step 6 through step 9 of this procedure, checking to ensure that the memory modules are firmly seated in their sockets.

19 Run the system memory test in the system diagnostics. See "Running the System Diagnostics" on page 173.

Removing Memory Modules

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

WARNING: The memory modules are hot to the touch for some time after the system has been powered down. Allow time for the memory modules to cool before handling them. Handle the memory modules by the card edges and avoid touching the components on the memory module.

CAUTION: To ensure proper system cooling, memory-module blanks must be installed in any memory socket that is not occupied. Install a memory-module blank if you are removing a memory module and do not intend to install a replacement.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.
5. Locate the memory module sockets. See Figure 6-1.
6. Press down and out on the ejectors on each end of the socket until the memory module pops out of the socket. See Figure 3-13.

CAUTION: Handle each memory module only by the card edges, ensuring not to touch the components on the module.

7. Replace any removed memory modules with memory-module blanks to ensure proper system cooling. See "Installing Memory Modules" on page 110 for installation instructions.
8. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
9. Close the system. See "Closing the System" on page 91.
10. Place the system upright and on its feet on a flat, stable surface.
11. Rotate the system feet outward.
12. Reattach any peripherals and connect the system to an electrical outlet.
13. Turn on the system and attached peripherals.

Expansion Cards

The system board can support up to four PCIe Generation 2 and one PCIe Generation 1 cards. To identify the expansion slots, see Figure 6-1.

Expansion Card Installation Guidelines

Observe the following notes and guidelines regarding the expansion-card slots:

- The expansion-card slots are not hot-swappable.
- PCI Express Generation 2 and Generation 1 expansion cards are supported in all slots.
- Slots 2 and 3 support full-length expansion cards; slots 1, 4, and 5 support half-length expansion cards.
- The system supports up to two SAS or PERC expansion cards to manage internal tape drives or external storage.

CAUTION: To ensure proper cooling, no more than two of the five expansion cards can have a power consumption of greater than 15 W (up to 25 W maximum each), not including the integrated storage controller.

Table 3-3. Expansion-Card Installation Order

Card Priority	Card Type	Slot Priority	Max Allowed	25-W Card
1	PERC 6/i controller	5,4	2	Y
2	SAS 6/iR controller	5,4	2	Y
3	SAS 5/iR controller	5,4	2	Y
4	PERC 6/E controller	5,4	2	Y
5	SAS 5/E controller	5,4	2	Y
6	All other Dell storage cards	3,2,4,5,1	2	Y
7	Non-Dell storage cards	4,5,1,2,3	5[1]	N[2]
8	All other NICs	2,1,3,4	4[1]	N[2]

1. Maximum of 2 of any card whose maximum power exceeds 15W.
2. Refer to the expansion card documentation to ensure that the maximum power does not exceed 15W.

Installing an Expansion Card

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

NOTE: Before installing any expansion cards, see ""Expansion Card Installation Guidelines" on page 114."

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Hold the touch points on the expansion card stabilizer and lift the expansion card stabilizer away from the cooling shroud. See Figure 3-14.
5. If you are installing a new card, remove the filler bracket.

   NOTE: Keep this bracket in case you need to remove the expansion card. Filler brackets must be installed over empty expansion-card slots to maintain FCC certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.
6. Prepare the card for installation.

   See the documentation that came with the card for information on configuring the card, making internal connections, or otherwise customizing it for your system.
7. Open the expansion-card latch adjacent to the slot. See Figure 3-14.
8. If you are installing a full-length expansion card (slots 2 and 3 only), thread the end of the card into the expansion card guide. See Figure 3-14.
9. Insert the card into the expansion card connector on the system board and press down firmly. Ensure that the card's metal tab is inserted in the expansion card tab slot. See Figure 3-14.
10. Close the expansion-card latch to secure the card in the system.

CAUTION: Do not route card cables over or behind the cards. Cables routed over the cards can prevent the system cover from closing properly or cause damage to the equipment.

11 Connect any expansion-card cables for the new card.

   See the documentation that came with the card for information about its cable connections.

12 Lower the expansion card stabilizer.

13 Close the system. See "Closing the System" on page 91.

14 Place the system upright and on its feet on a flat, stable surface.

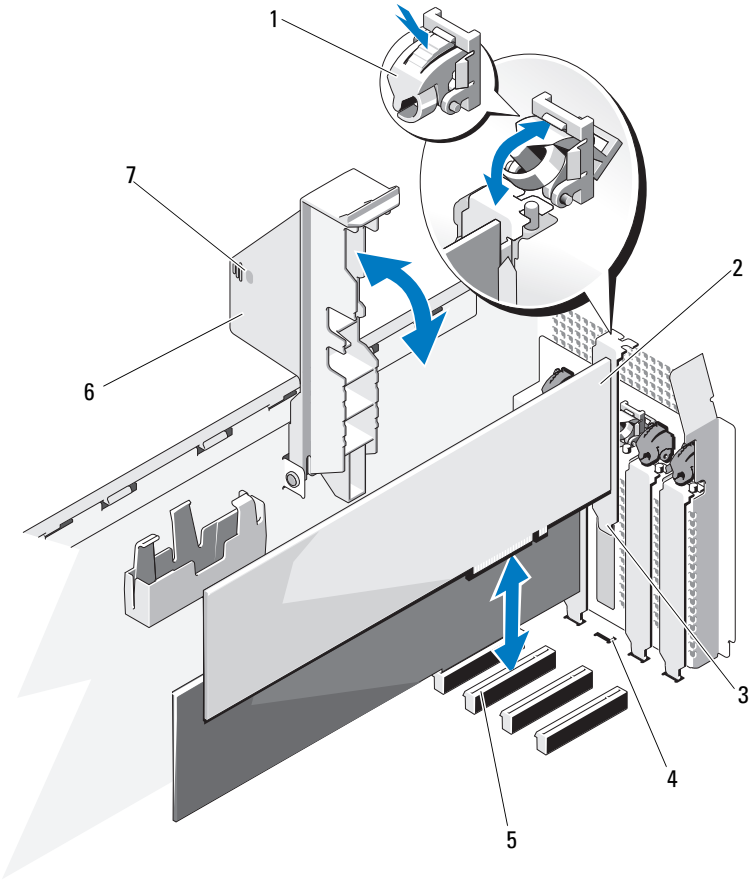
15 Rotate the system feet outward.

16 Reattach any peripherals and connect the system to an electrical outlet.

17 Turn on the system and attached peripherals.

18 Install any device drivers required for the card as described in the documentation for the card.

Figure 3-14. Removing and Installing an Expansion Card



1	expansion card latch	2	expansion card
3	expansion card tab	4	expansion card tab slot
5	expansion card connector	6	expansion card stabilizer
7	expansion card stabilizer touch points (2)		

Removing an Expansion Card

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Hold the touch points on the expansion card stabilizer and lift the expansion card stabilizer away from the cooling shroud. See Figure 3-14.
5. Disconnect any cables connected to the expansion card.
6. Remove the expansion card:
   a. Open the expansion card latch adjacent to the slot. See Figure 3-14.
   b. Grasp the expansion card by its top corners, and carefully pull the card from the expansion-card connector.
7. If you are removing the card permanently, install a filler bracket in the empty card slot.

   NOTE: Filler brackets must be installed over empty expansion card slots to maintain Federal Communications Commission (FCC) certification of the system. The brackets also keep dust and dirt out of the system and aid in proper cooling and airflow inside the system.
8. Hold the touch points and lower the expansion card stabilizer.
9. Close the system. See "Closing the System" on page 91.
10. Place the system upright and on its feet on a flat, stable surface.
11. Rotate the system feet outward.
12. Reattach any peripherals and connect the system to an electrical outlet.
13. Turn on the system and attached peripherals.
14. Remove the card's device driver from the operating system.

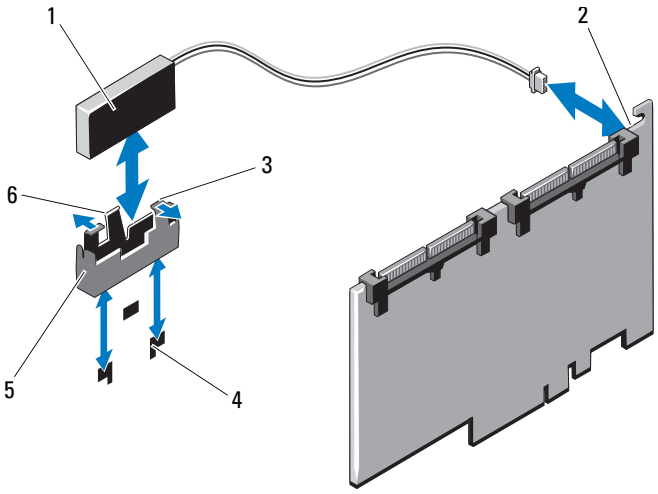
RAID Battery (Optional)

Removing the RAID Battery

The information in this section applies only to systems with the optional PERC controller card.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Hold the touch points and lift the expansion card stabilizer away from the cooling shroud.
5. Remove the storage controller card. See "Removing an Expansion Card" on page 118.
6. To disconnect the RAID battery cable from the connector on the storage card, press the tab on the RAID battery cable connector, and gently pull the cable connector out of the connector on the storage card. See Figure 3-15.
7. Pull the battery carrier release tab, and lift the battery carrier out of the battery carrier slots on the chassis. See Figure 3-15.
8. Pull back gently on the two tabs holding the RAID battery and lift the RAID battery from the battery carrier. See Figure 3-15.

Figure 3-15. Removing and Installing the RAID Battery



1	RAID battery	2	battery cable connector
3	battery carrier tabs	4	battery carrier slots (2)
5	battery carrier	6	battery carrier release tab

Installing a RAID Battery

1. Insert the RAID battery into the battery carrier. See Figure 3-15.
2. Align the tabs on the battery carrier with the battery carrier slots on the chassis.
3. Slide the battery carrier into the battery carrier slots until it locks into place. See Figure 3-15.
4. Connect the battery cable to the connector on the storage card and replace the storage controller card. See "Installing an Expansion Card" on page 115.
5. Hold the touch points and lower the expansion card stabilizer.
6. Close the system. See "Closing the System" on page 91.
7. Place the system upright and on its feet on a flat, stable surface.

8 Rotate the system feet outward.

9 Reattach any peripherals and connect the system to an electrical outlet.

10 Turn on the system and attached peripherals.

Power Supplies

Depending on your configuration, your system supports up to two hot-swappable redundant 580-W power supplies or a single non-redundant 525-W power supply.

In redundant mode, the system distributes the power load across both power supplies to maximize efficiency. The second power supply provides power redundancy; thus, when a power supply is removed with the system powered on, the full power load is carried by the remaining power supply.

Removing a Redundant Power Supply

CAUTION: The system requires one power supply to operate the system normally. On power-redundant systems, remove and replace only one power supply at a time in a system that is powered on.

CAUTION: If you are replacing a redundant power supply while your system is on, ensure that both the power supply status and the AC line status LEDs are green before removing the power supply (see Figure 1-6). If one or both of the LEDs are not green, see "Troubleshooting Power Supplies" on page 161.

1 Disconnect the power cable from the electrical outlet.

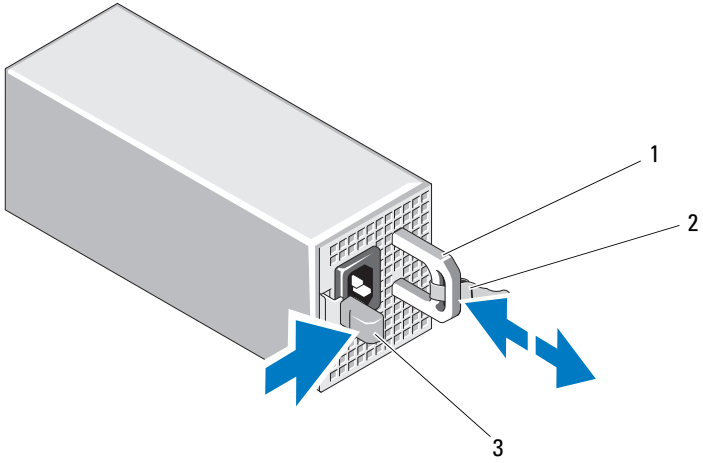
2 Disconnect the power cable from the power supply and remove the cable from the cable retention bracket.

3 Press the release latch and slide the power supply out of the chassis. See Figure 3-16.

4 If you are installing another power supply in the bay, see "Installing a Redundant Power Supply" on page 122.

If the power supply is being permanently removed, install a power supply blank. See "Installing a Power Supply Blank" on page 123.

Figure 3-16. Removing and Installing a Redundant Power Supply



1 power supply handle
2 velcro strap
3 release latch

Installing a Redundant Power Supply

1. Verify that both power supplies are the same type and have the same maximum output power.

   NOTE: The maximum output power (shown in watts) is listed on the power supply label.

2. If you are installing a power supply into an empty bay, remove the power supply blank. See "Removing a Power Supply Blank" on page 123.

   If you are installing a power supply into a bay that has a power supply, see "Removing a Redundant Power Supply" on page 121.

3 Slide the new power supply into the chassis until the power supply is fully seated and the release latch snaps into place. See Figure 3-18.

4 Connect the power cable to the power supply and plug the cable into a power outlet.

CAUTION: When connecting the power cable, secure the cable with the Velcro strap.

NOTE: When hot-swapping a new power supply, allow several seconds for the system to recognize the power supply and determine whether it is working properly. The power supply status indicator will turn green to signify that the power supply is functioning properly (see Figure 1-6).

Removing a Power Supply Blank

If you are installing a second power supply, remove the power supply blank in the bay by pulling firmly on the hole in the middle of the blank.

CAUTION: To ensure proper system cooling, the power supply blank must be installed in the second power supply bay in a non-redundant configuration. Remove the power supply blank only if you are installing a second power supply.

Installing a Power Supply Blank

NOTE: A power supply blank must only be installed in the second power supply bay.

To install a power supply blank, align the blank with the power supply bay and insert it into the chassis until it clicks into place.

Removing a Non-Redundant Power Supply

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

2 Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

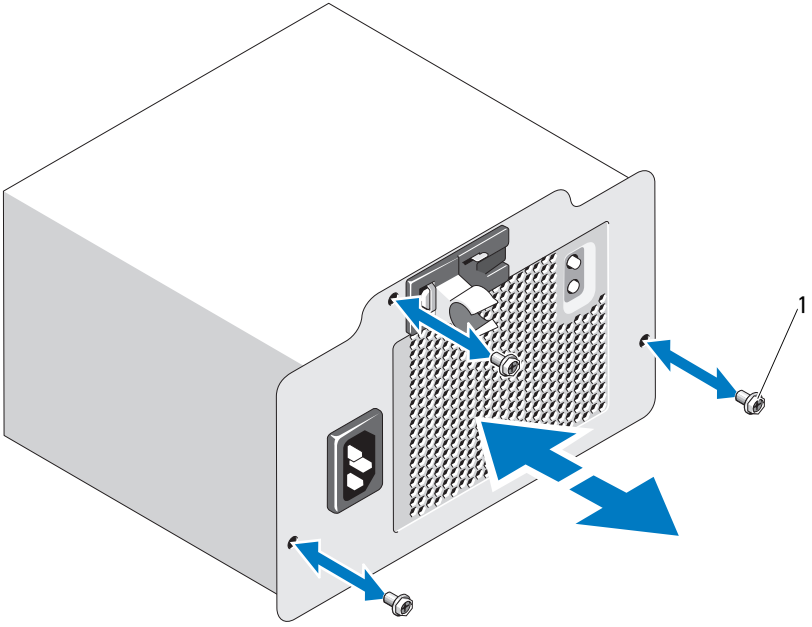
4 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

5 Disconnect all the cables from the system board and drives.

NOTE: Note the routing of the power cables as you disconnect the cables from the system board and drives. You must route these cables properly when you replace them to prevent them from being pinched or crimped.

6 Remove the screws that secure the power supply to the chassis and slide the power supply out of the system. See Figure 3-17.

Figure 3-17. Removing and Installing a Non-Redundant Power Supply



1 screws (3)

Installing a Non-Redundant Power Supply

1. Slide the power supply into the back of the chassis.
2. Replace the screws that secure the power supply to the chassis. See Figure 3-17.
3. Connect all the power cables to the system board and drives.

   Ensure that all the cables are routed properly to prevent the cables from being pinched or crimped.
4. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
5. Close the system. See "Closing the System" on page 91.
6. Place the system upright and on its feet on a flat, stable surface.
7. Rotate the system feet outward.
8. Reattach any peripherals and connect the system to an electrical outlet.
9. Turn on the system and attached peripherals.

Internal USB Memory Key

An optional USB memory key installed inside your system can be used as a boot device, security key, or mass storage device.

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Locate the USB connector on the system board. See Figure 6-1.
5. Insert the USB memory key into the USB connector. See Figure 3-18.
6. Close the system. See "Closing the System" on page 91.
7. Place the system upright and on its feet on a flat, stable surface.
8. Rotate the system feet outward.
9. Reattach any peripherals and connect the system to an electrical outlet.

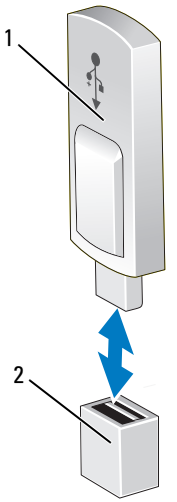
10 Reconnect the system to power and restart the system.

11 Enter the System Setup program and verify that the USB key has been detected by the system. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

The USB connector must be enabled by the **Internal USB Port** option in the **Integrated Devices** screen of the System Setup program.

To boot from the USB memory key, configure the USB memory key with a boot image and then specify the USB memory key in the boot sequence in the System Setup program.

Figure 3-18. Removing or Installing a USB Memory Key



1 USB memory key

2 USB memory key connector

Integrated Dell Remote Access Controller 6 (iDRAC6) Express Card (Optional)

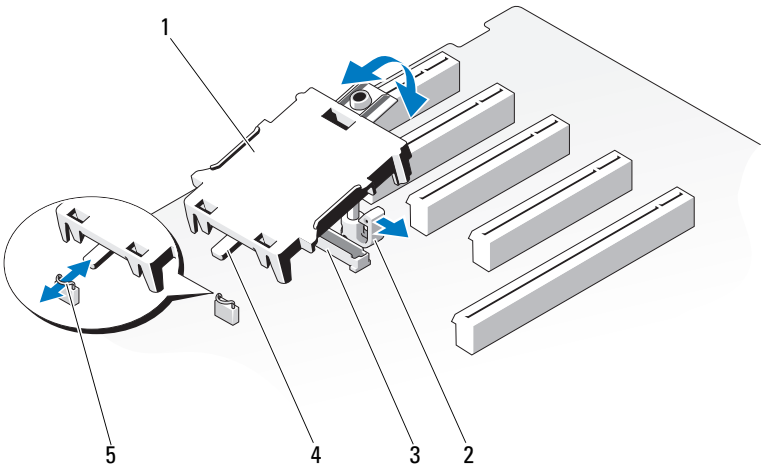
Installing an iDRAC6 Express Card

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. To install the iDRAC6 Express card:
   a. Insert the notch on the iDRAC6 Express card into the clip on the system board.
   b. Align the front edge of the card with the connector on the system board. See Figure 6-1 for the location of the connector.
   c. Press the card down until it is fully seated. See Figure 3-20.

      When the front of the card is fully seated, the plastic standoff tab snaps over the edge of the holder.
5. Close the system. See "Closing the System" on page 91.
6. Place the system upright and on its feet on a flat, stable surface.
7. Rotate the system feet outward.
8. Reattach any peripherals and connect the system to an electrical outlet.
9. Turn on the system and attached peripherals.

Figure 3-19. Removing and Installing an iDRAC6 Express Card



1	iDRAC6 Express card	2	retention standoff tab clip
3	iDRAC6 Express card connector	4	notch
5	clip		

Removing an iDRAC6 Express Card

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.

4 To remove the iDRAC6 Express card:

   a Pull back slightly on the retention standoff tab at the front edge of the card and gently lift the card off the retention standoff. See Figure 3-20.

   As the card releases from the standoff tab, the connector under the card disengages from the system board connector.

   b Angle the card so that the notch on the card slips through the clip on the system board.

5 Close the system. See "Closing the System" on page 91.

6 Place the system upright and on its feet on a flat, stable surface.

7 Rotate the system feet outward.

8 Reattach any peripherals and connect the system to an electrical outlet.

9 Turn on the system and attached peripherals.

Integrated Dell Remote Access Controller 6 (iDRAC6) Enterprise Card (Optional)

The optional iDRAC6 Enterprise card provides a set of advanced features for managing the system remotely.

Installing an iDRAC6 Enterprise Card

⚠ **WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.**

1 Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.

2 Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

4 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

5 Remove the plastic filler plug for the iDRAC6 Enterprise port from the system back panel. See "Back-Panel Features and Indicators" on page 20 for the port location.

6 Install the iDRAC6 Enterprise card:

   a Angle the card so that the RJ-45 connector fits through the back-panel opening.

   b Align the front edge of the card with the two front plastic retention standoffs near the iDRAC6 Enterprise card connector on the system board. See Figure 6-1 for the location of the connector.

   c Press the card down until it is fully seated. See Figure 3-20.

   When the front of the card is fully seated, the plastic standoff tabs snap over the edge of the card.

7 Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.

8 Close the system. See "Closing the System" on page 91.

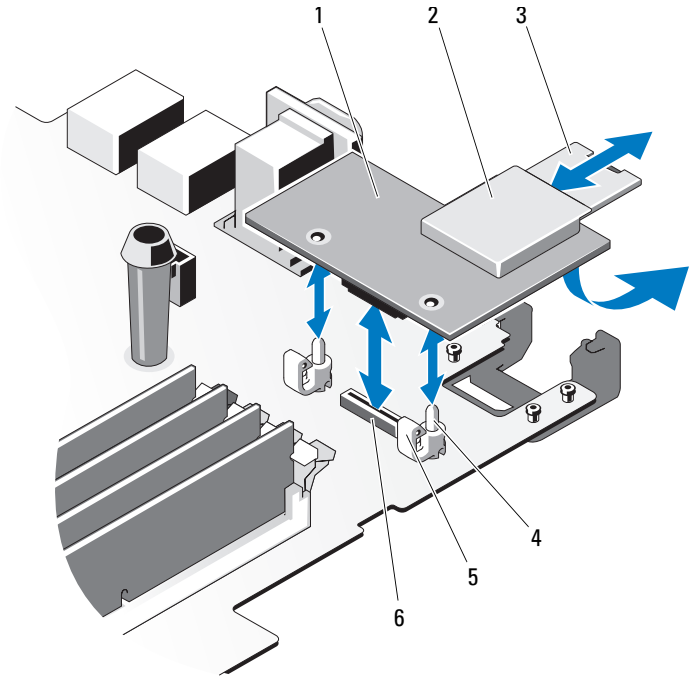
9 Place the system upright and on its feet on a flat, stable surface.

10 Rotate the system feet outward.

11 Reattach any peripherals and connect the system to an electrical outlet.

12 Turn on the system and attached peripherals.

Figure 3-20. Removing and Installing an iDRAC6 Enterprise Card



1	iDRAC6 Enterprise Card	2	VFlash media slot
3	VFlash SD card	4	Retention standoff posts (2)
5	Retention standoff tabs (2)	6	iDRAC6 Enterprise card connector

Removing an iDRAC6 Enterprise Card

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from its electrical outlet.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.
5. Remove the VFlash media card (if installed) from the iDRAC6 Enterprise card. See "VFlash Media (Optional)" on page 133.
6. If present, disconnect the Ethernet cable from the iDRAC6 Enterprise card.
7. Remove the iDRAC6 Enterprise card:
   a. Pull back slightly on the two tabs at the front edge of the card and gently lift the front edge of the card off of the retention standoffs.

      As the card releases from the standoffs, the connector under the card disengages from the system board connector.

   b. Slide the card away from the back of the system until the RJ-45 connector is clear of the back panel and then lift the card out of the system. See Figure 3-20.
8. Install the plastic filler plug for the iDRAC6 Enterprise port in the system back-panel.
9. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
10. Close the system. See "Closing the System" on page 91.
11. Place the system upright and on its feet on a flat, stable surface.
12. Rotate the system feet outward.
13. Reattach any peripherals and connect the system to an electrical outlet.
14. Turn on the system and attached peripherals.

VFlash Media (Optional)

The VFlash media is a Secure Digital (SD) card that can be used with the optional iDRAC6 Enterprise card.

Installing a VFlash Media

1. Locate the VFlash media slot at the back of the system. See "Back-Panel Features and Indicators" on page 20 for the location of the media slot.
2. With the label side facing up, insert the contact-pin end of the SD card into the card slot on the module.

   NOTE: The slot is keyed to ensure correct insertion of the card.
3. Press the card to lock it into the slot.

Removing a VFlash Media

To remove the VFlash media, push inward on the card to release it and pull the card from the card slot.

System Fan

Removing the System Fan

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

WARNING: The system fan can continue to spin for some time after the system has been powered down. Allow time for the fan to stop spinning before removing it from the system.

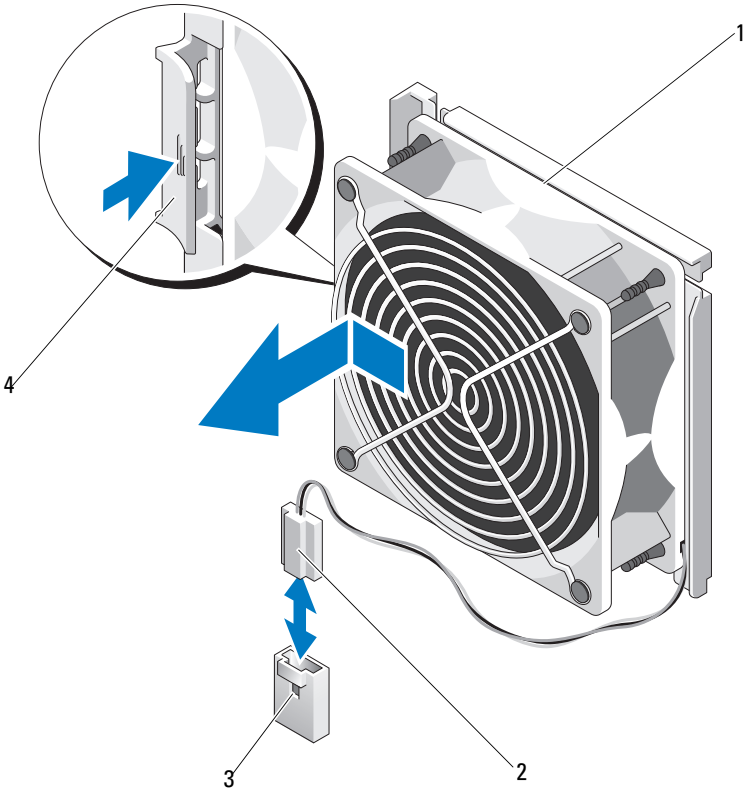
WARNING: Do not attempt to operate the system without the system fan.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

5 Disconnect the system fan power cable from the system board. See Figure 3-21.

6 Press the fan release tab and slide the fan out of the securing slots on the chassis. See Figure 3-21.

Figure 3-21. Removing and Installing the System Fan



1	system fan	2	power cable
3	FAN connector on the system board	4	release tab

Installing the System Fan

1. Align the tabs on the system fan with the securing slots on the chassis.
2. Slide the system fan into the securing slots until the tabs lock into place. See Figure 3-21.
3. Connect the system fan power cable to the system board.
4. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
5. Close the system. See "Closing the System" on page 91.
6. Place the system upright and on its feet on a flat, stable surface.
7. Rotate the system feet outward.
8. Reattach any peripherals and connect the system to an electrical outlet.
9. Turn on the system and attached peripherals.

Processors

Removing a Processor

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Prior to upgrading your system, download the latest system BIOS version on **support.dell.com**.
2. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
3. Rotate the system feet inward and lay the system on a flat surface.
4. Open the system. See "Opening the System" on page 90.
5. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

CAUTION: Never remove the heat sink from a processor unless you intend to remove the processor. The heat sink is necessary to maintain proper thermal conditions.

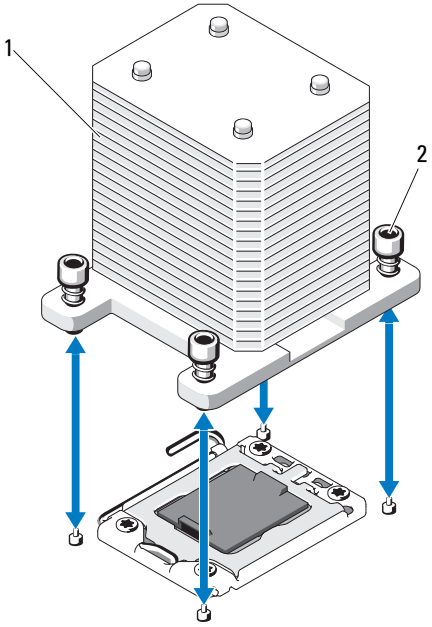
6. Using a #2 Phillips screwdriver, loosen one of the heat-sink retention screws. See Figure 3-22.
7. Wait 30 seconds for the heat sink to loosen from the processor.
8. Repeat step 6 and step 7 to loosen the three heat-sink retention screws.

9 Gently lift the heat sink off of the processor and set the heat sink aside with the thermal grease side facing up.

CAUTION: The processor is held in its socket under strong pressure. Be aware that the release lever can spring up suddenly if not firmly grasped.

10 Position your thumb firmly over the processor socket-release lever and release the lever from the locked position. Rotate the lever 90 degrees upward until the processor is released from the socket. See Figure 3-23.

Figure 3-22. Installing and Removing the Heat Sink



1 heat sink

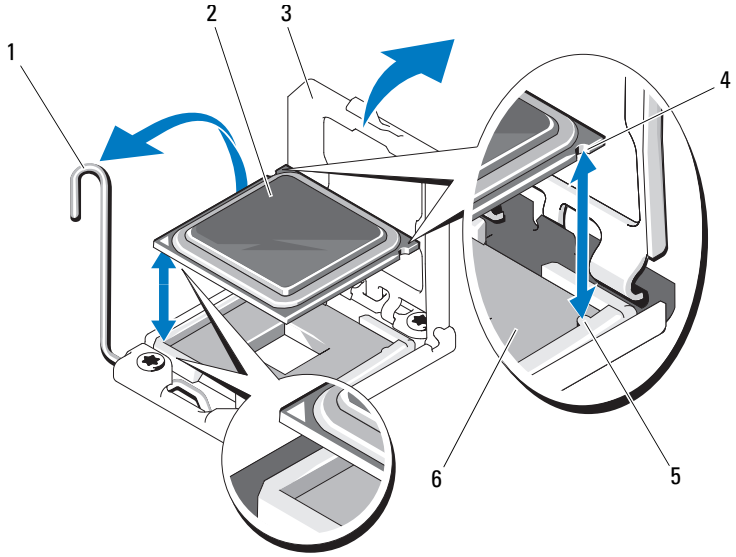
2 heat-sink retention screws (4)

11 Rotate the processor shield upward and out of the way. See Figure 3-23.

12 Lift the processor out of the socket and leave the release lever up so that the socket is ready for the new processor.

CAUTION: Be careful not to bend any of the pins on the ZIF socket when removing the processor. Bending the pins can permanently damage the system board.

Figure 3-23. Installing and Removing a Processor



1	socket-release lever	2	processor
3	processor shield	4	notch in processor (2)
5	socket key (2)	6	ZIF socket

Installing a Processor

1. Unpack the new processor.
2. Align the processor with the socket keys on the ZIF socket. See Figure 3-23.
3. Install the processor in the socket.

CAUTION: Positioning the processor incorrectly can permanently damage the system board or the processor. Be careful not to bend the pins in the socket.

   a. With the release lever on the processor socket in the open position, align the processor with the socket keys and set the processor lightly in the socket.

CAUTION: Do not use force to seat the processor. When the processor is positioned correctly, it engages easily into the socket.

   b. Close the processor shield.

   c. Rotate the socket release lever down until it snaps into place.

4. Install the heat sink.

   a. Using a clean lint-free cloth, remove the thermal grease from the heat sink.

   b. Open the grease packet included with your processor kit and apply thermal grease evenly to the top of the new processor.

   c. Place the heat sink on the processor. See Figure 3-22.

   d. Using a #2 Phillips screwdriver, tighten the heat-sink retention screws. See Figure 3-22.

5. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
6. Close the system. See "Closing the System" on page 91.
7. Place the system upright and on its feet on a flat, stable surface.
8. Rotate the system feet outward.
9. Reattach any peripherals and connect the system to an electrical outlet.
10. Turn on the system and attached peripherals.

11 Press <F2> to enter the System Setup program, and check that the processor information matches the new system configuration. See "Entering the System Setup Program."

12 Run the system diagnostics to verify that the new processor operates correctly.

See "Running the Embedded System Diagnostics" on page 174 for information about running the diagnostics.

System Battery

Replacing the System Battery

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

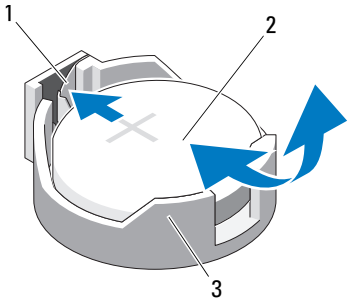
WARNING: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. See your safety information for additional info.

1 Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

2 Rotate the system feet inward and lay the system on a flat surface.

3 Open the system. See "Opening the System" on page 90.

Figure 3-24. Replacing the System Battery



1 positive side of battery connector
2 system battery
3 negative side of battery connector

4 Locate the battery socket. See "System Board Connectors" on page 178.

CAUTION: To avoid damage to the battery connector, you must firmly support the connector while installing or removing a battery.

5 Remove the system battery.

a Support the battery connector by pressing down firmly on the positive side of the connector.

b Press the battery towards the positive side of the connector and lift it up out of the securing tabs at the negative side of the connector.

6 Install the new system battery.

a Support the battery connector by pressing down firmly on the positive side of the connector.

b Hold the battery with the "+" facing up, and slide it under the securing tabs at the positive side of the connector.

c Press the battery straight down into the connector until it snaps into place.

7 Close the system. See "Closing the System" on page 91.

8 Place the system upright and on its feet on a flat, stable surface.

9 Rotate the system feet outward.

10 Reattach any peripherals and connect the system to an electrical outlet.

11 Turn on the system and attached peripherals.

12 Enter the System Setup program to confirm that the battery is operating properly. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

13 Enter the correct time and date in the System Setup program's **Time** and **Date** fields.

14 Exit the System Setup program.

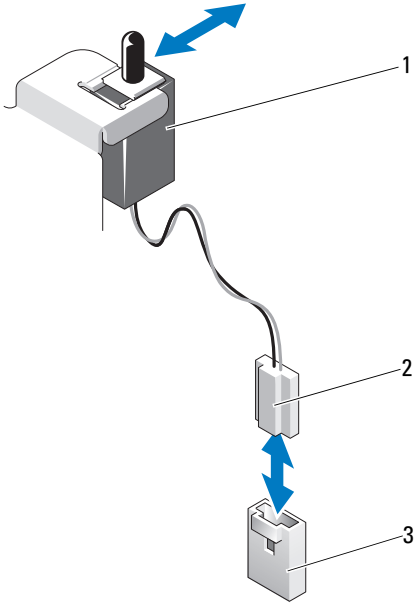
Chassis Intrusion Switch

Removing the Chassis Intrusion Switch

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Disconnect the chassis intrusion switch cable from the connector on the system board. See Figure 3-25
5. Slide the chassis intrusion switch out of the securing bracket notch.

Figure 3-25. Removing and Installing the Chassis Intrusion Switch



1	chassis intrusion switch	2	chassis intrusion switch cable
3	INTRUSION connector on the system board		

Installing the Chassis Intrusion Switch

1. Align the chassis intrusion switch with the securing bracket notch. See Figure 3-25.
2. Slide the switch into the securing bracket notch. See Figure 3-25.
3. Connect the chassis intrusion switch cable to the connector on the system board.
4. Close the system. See "Closing the System" on page 91.
5. Place the system upright and on its feet on a flat, stable surface.
6. Rotate the system feet outward.
7. Reattach any peripherals and connect the system to an electrical outlet.
8. Turn on the system and attached peripherals.

Control Panel Assembly (Service-Only Procedure)

Removing the Control Panel Assembly

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Remove the bezel. See "Removing the Front Bezel" on page 85.
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
3. Rotate the system feet inward and lay the system on a flat surface.
4. Open the system. See "Opening the System" on page 90.

CAUTION: Do not pull the cable to unseat the connector. Doing so can damage the cable.

5 To disconnect the control panel cable from the connector on the system board:

   a Squeeze the metal tabs on the ends of the cable connector. See Figure 3-26.

   b Gently pull the connector out of the socket.

6 Using a Phillips screwdriver, remove the screw that secures the control panel assembly to the chassis. See Figure 3-26.

7 Press the release latch and slide the control panel away from chassis.

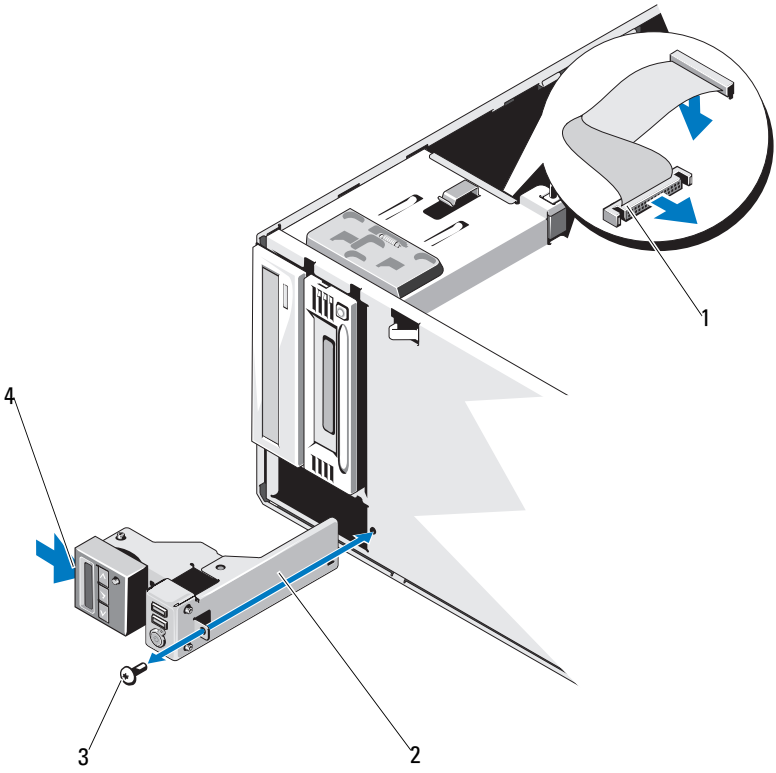
CAUTION: Do not pull the cable to unseat the connector. Doing so can damage the cable.

8 To disconnect the control panel cable from the connector on the control panel board:

   a Squeeze the metal tabs on the ends of the cable connector. See Figure 3-26.

   b Gently pull the connector out of the socket.

Figure 3-26. Removing and Installing the Control Panel



1	control panel cable	2	control panel assembly
3	control panel screw	4	release latch

Installing the Control Panel Assembly

1. Connect the control panel cable to the control panel board.
2. Using a Phillips screwdriver, replace the screw that secure the control panel assembly to the chassis.
3. Connect the control panel cable to the system board. See Figure 3-26.
4. Close the system. See "Closing the System" on page 91.
5. Place the system upright and on its feet on a flat, stable surface.
6. Rotate the system feet outward.
7. Replace the front bezel. See "Installing the Front Bezel" on page 86.
8. Reattach any peripherals and connect the system to an electrical outlet.
9. Turn on the system and attached peripherals.

SAS Backplane (Service-Only Procedure)

Removing the SAS Backplane

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Rotate the system feet inward and lay the system on a flat surface.
3. Open the system. See "Opening the System" on page 90.
4. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.
5. Remove all the hard drives. See "Removing a Hot-Swap Hard Drive" on page 94.
6. Disconnect all the cables connected to the SAS backplane (see Figure 3-27):
   - SAS A cable
   - SAS B cable
   - Hard drive activity indicator cable
   - Backplane power cable

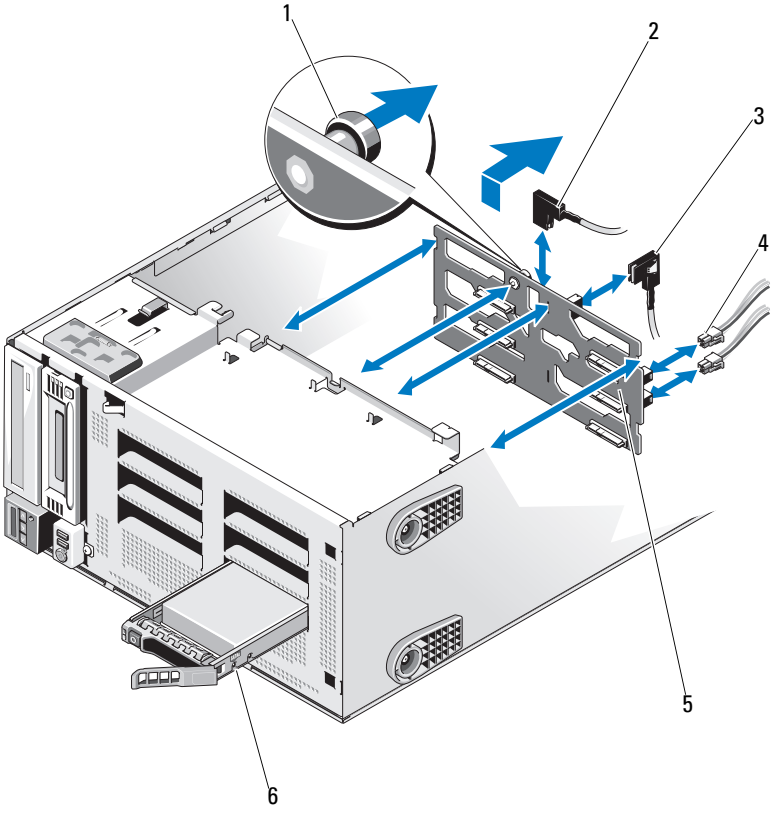
7 Disconnect all the cables that are routed over the notch in the SAS backplane board.

8 To remove the SAS backplane:

a Pull the blue release pin and slide the backplane upwards.

b Pull the backplane away from the front of the system until the securing slots are free from the tabs on the chassis.

Figure 3-27. Removing and Installing the SAS Backplane



1	blue release pin	2	SAS A cable
3	SAS B cable	4	backplane power cables (2)
5	SAS backplane	6	hard drive

Installing the SAS Backplane

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Align the slots on the SAS backplane with the tabs on the chassis.
2. Slide down the SAS backplane until the release pin snaps into place. See Figure 3-27.
3. Reconnect the cables that were routed over the notch in the SAS backplane.
4. Reconnect the cables connected to the SAS backplane (see Figure 3-27):
   - SAS A cable
   - SAS B cable
   - Hard drive activity indicator cable
   - Backplane power cable
5. Replace all the hard drives. See "Installing a Hot-Swap Hard Drive" on page 96.
6. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
7. Close the system. See "Closing the System" on page 91.
8. Reattach any peripherals and connect the system to an electrical outlet.
9. Turn on the system and attached peripherals.

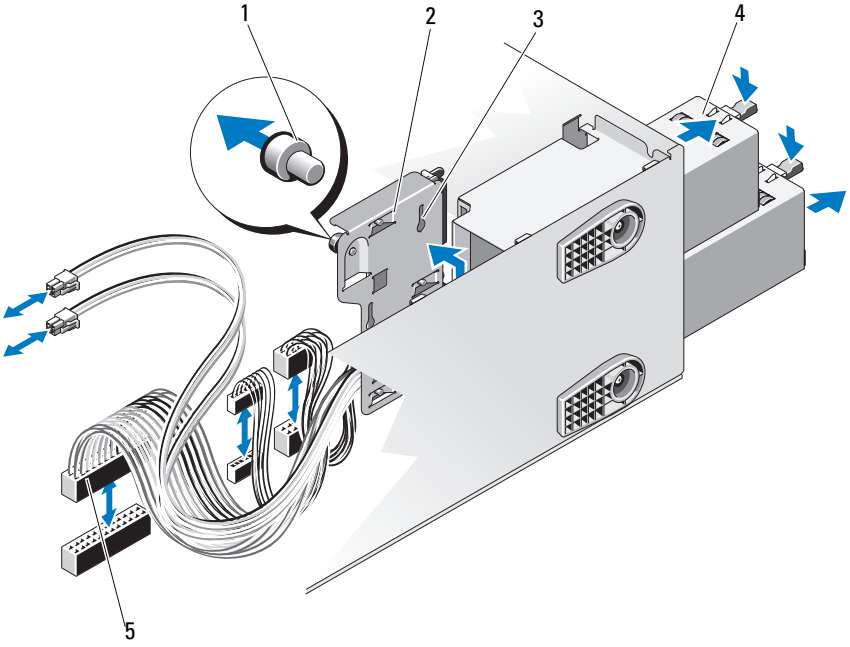
Power Distribution Board (Service-Only Procedure)

Removing the Power Distribution Board

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Remove the power supplies. See "Removing a Redundant Power Supply" on page 121.
3. Rotate the system feet inward and lay the system on a flat surface.
4. Open the system. See "Opening the System" on page 90.
5. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.
6. Disconnect all the power distribution board cables connected to the system board.
7. To remove the power distribution board:
   a. Pull the blue release pin and slide the board upwards.
   b. Pull the board away from the chassis until the securing slots on the board are free from the tabs on the chassis.

Figure 3-28. Removing and Installing the Power Distribution Board



1	blue release pin	2	power distribution board
3	securing slots	4	power supply units (2)
5	power distribution board cables (5)		

Installing the Power Distribution Board

1. Align the securing slots on the power distribution board with the tabs on the chassis.
2. Slide the board downwards until the blue release pin locks into place.
3. Connect all the power distribution board cables to the system board.
4. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
5. Replace the power supplies. See "Installing a Redundant Power Supply" on page 122.
6. Close the system. See "Closing the System" on page 91.
7. Place the system upright and on its feet on a flat, stable surface.
8. Rotate the system feet outward.
9. Reattach any peripherals and connect the system to an electrical outlet.
10. Turn on the system and attached peripherals.

System Board (Service-Only Procedure)

WARNING: The heat sink can get hot during operation. To avoid burns, ensure that the system has sufficient time to cool before removing the system board.

CAUTION: If you are using the Trusted Platform Module (TPM) with an encryption program, you may be prompted to create a recovery key during system or program setup. Be sure to create and safely store this recovery key. If you ever need to replace the system board, you must supply the recovery key when you restart your system or program before you can access the encrypted data on your hard drive(s).

Removing the System Board

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Remove the front bezel. See "Removing the Front Bezel" on page 85.
3. Rotate the system feet inward and lay the system on a flat surface.

4 Open the system. See "Opening the System" on page 90.

5 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

6 Disconnect all the cables from the system board.

7 If applicable, remove all expansion cards and any attached cables. See "Removing an Expansion Card" on page 118.

8 If applicable, remove the iDRAC6 Express card. See "Removing an iDRAC6 Express Card" on page 128.

9 If applicable, remove the iDRAC6 Enterprise card. See "Removing an iDRAC6 Enterprise Card" on page 132.

10 Remove all the memory modules and memory blanks. See "Removing Memory Modules" on page 113.

NOTE: To ensure proper reinstallation of memory modules, record the memory module socket locations.

11 Remove the system fan. See "Removing the System Fan" on page 133.

WARNING: The heat sink can get hot during operation. To avoid burns, ensure that the system has sufficient time to cool before removing the system board.

12 Remove any installed heat sinks, processors and heat-sink blanks. See "Removing a Processor" on page 135.

13 If applicable, remove the SAS backplane from system. See "Removing the SAS Backplane" on page 145.

14 Carefully route any loose cables away from the edges of the system board.

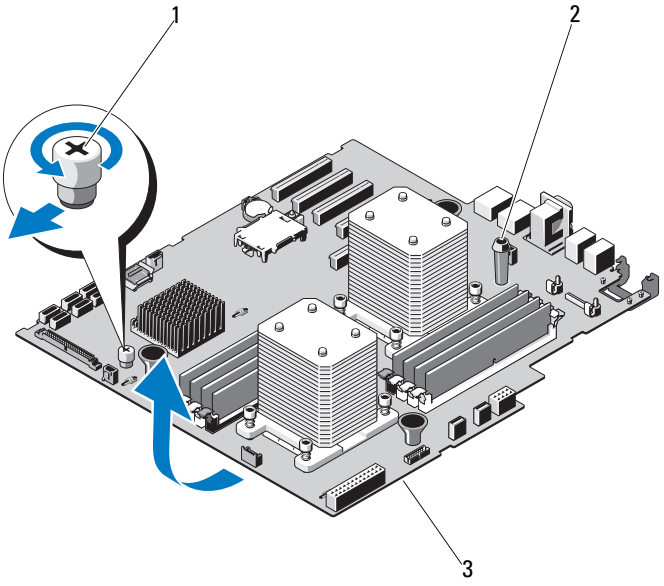
15 To remove the system board:

a Using a Phillips screwdriver, loosen the captive screw. See Figure 3-29.

b While holding the system board captive screw and the blue touch point, slide the system board toward the front of the system. See Figure 3-29.

c Lift the system board until the securing slots on the system board are free from the tabs on the chassis.

Figure 3-29. Removing and Installing the System Board



1	captive screw	2	touch point
3	system board		

Installing the System Board

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Unpack the new system board and remove the label that is located on the processor shield.
2. Remove the labels and affix them on the front of the chassis.
3. To replace the system board:
   a. Grip the system board by holding the touch point and the captive screw.
   b. Align the securing slots on the system board with the tabs on the chassis and lower the system board into the chassis.
   c. Slide the system board towards the back of the system, inserting the connectors into the cutouts in the chassis.
   d. Using a Phillips screwdriver, tighten the captive screw.
4. If applicable, replace the SAS backplane. See "Installing the SAS Backplane" on page 147.
5. Replace heatsinks, processors, and heatsink blanks (if applicable). See "Installing a Processor" on page 138.
6. Replace the system fan. See "Installing the System Fan" on page 135.
7. Replace all the memory modules and memory blanks. See "Installing Memory Modules" on page 110.
8. If applicable, replace the iDRAC6 Express card. See "Installing an iDRAC6 Express Card" on page 127.
9. If applicable, replace the iDRAC6 Enterprise card. See "Installing an iDRAC6 Enterprise Card" on page 129.
10. If applicable, replace all the expansion cards. See "Installing an Expansion Card" on page 115.
11. Connect all the cables to the system board.
12. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
13. Close the system. See "Closing the System" on page 91.

14 Place the system upright and on its feet on a flat, stable surface.

15 Rotate the system feet outward.

16 Replace the front bezel. See "Installing the Front Bezel" on page 86.

17 Reattach any peripherals and connect the system to an electrical outlet.

18 Turn on the system and attached peripherals.

4

Troubleshooting Your System

Safety First — For You and Your System

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

Troubleshooting System Startup Failure

If your system halts during startup prior to video imaging or LCD messaging, especially after installing an operating system or reconfiguring your system's hardware, check for the following conditions:

- If you boot the system to the BIOS boot mode after installing an operating system from the UEFI Boot Manager, the system will hang. The reverse is also true. You must boot to the same boot mode in which you installed the operating system. See "Using the System Setup Program and UEFI Boot Manager" on page 61.
- Invalid memory configurations could cause the system to halt at startup without any video output. See "System Memory" on page 106.

For all other startup issues, note the LCD panel messages and any system messages that appear onscreen. See "LCD Status Messages (Optional)" on page 28 and "System Messages" on page 42 for more information.

Troubleshooting External Connections

Ensure that all external cables are securely attached to the external connectors on your system before troubleshooting any external devices. See Figure 1-1 and Figure 1-4 for the front- and back-panel connectors on your system.

Troubleshooting the Video Subsystem

1. Check the system and power connections to the monitor.
2. Check the video interface cabling from the system to the monitor.
3. Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

   If the tests run successfully, the problem is not related to video hardware.

   If the tests fail, see "Getting Help" on page 185

Troubleshooting a USB Device

1. Use the following steps to troubleshoot a USB keyboard and/or mouse. For other USB devices, go to step 2.
   a. Disconnect the keyboard and mouse cables from the system briefly and reconnect them.
   b. Connect the keyboard/mouse to the USB port(s) on the opposite side of the system.

      If the problem is resolved, restart the system, enter the System Setup program, and check if the nonfunctioning USB ports are enabled.
   c. Replace the keyboard/mouse with another working keyboard/mouse.

      If the problem is resolved, replace the faulty keyboard/mouse.

      If the problem is not resolved, proceed to the next step to begin troubleshooting the other USB devices attached to the system.
2. Power down all attached USB devices and disconnect them from the system.
3. Restart the system and, if your keyboard is functioning, enter the system setup program. Verify that all USB ports are enabled. See "Integrated Devices Screen" on page 69.

   If your keyboard is not functioning, you can also use remote access. If the system is not accessible, see "SAS Backplane Board Connectors" on page 181 for instructions on setting the NVRAM_CLR jumper inside your system and restoring the BIOS to the default settings.

4 Reconnect and power on each USB device one at a time.

5 If a device causes the same problem, power down the device, replace the USB cable, and power up the device.

If the problem persists, replace the device.

If all troubleshooting fails, see "Getting Help" on page 185.

Troubleshooting a Serial I/O Device

1 Turn off the system and any peripheral devices connected to the serial port.

2 Swap the serial interface cable with another working cable, and turn on the system and the serial device.

If the problem is resolved, replace the interface cable.

3 Turn off the system and the serial device, and swap the device with a comparable device.

4 Turn on the system and the serial device.

If the problem is resolved, replace the serial device.

If the problem persists, see "Getting Help" on page 185.

Troubleshooting a NIC

1 Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

2 Restart the system and check for any system messages pertaining to the NIC controller.

3 Check the appropriate indicator on the NIC connector. See "NIC Indicator Codes" on page 23.

- If the link indicator does not light, check all cable connections.
- If the activity indicator does not light, the network driver files might be damaged or missing.

  Remove and reinstall the drivers if applicable. See the NIC's documentation.

- Change the auto negotiation setting, if possible.
- Use another connector on the switch or hub.

If you are using a NIC card instead of an integrated NIC, see the documentation for the NIC card.

4 Ensure that the appropriate drivers are installed and the protocols are bound. See the NIC's documentation.

5 Enter the System Setup program and confirm that the NIC ports are enabled. See "Integrated Devices Screen" on page 69.

6 Ensure that the NICs, hubs, and switches on the network are all set to the same data transmission speed. See the documentation for each network device.

7 Ensure that all network cables are of the proper type and do not exceed the maximum length.

If all troubleshooting fails, see "Getting Help" on page 185.

Troubleshooting a Wet System

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

2 Open the system. See "Opening the System" on page 90.

3 Remove the following components from the system. See "Installing System Components" on page 83.

- Cooling shroud
- Hard drives
- SD cards
- USB memory keys
- NIC hardware key
- Internal SD module
- Expansion cards
- iDRAC6 Enterprise card

- iDRAC6 Express card
- Power supplies
- Fans
- Processors and heat sinks
- Memory modules

4 Reinstall the processors and heat sinks, memory modules, power supplies, and cooling shroud.

5 Close the system. See "Closing the System" on page 91.

6 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

7 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the system does not start properly, see "Getting Help" on page 185.

8 If the system starts properly, shut down the system and reinstall the rest of the components that you removed. See "Installing System Components" on page 83.

9 Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

If the tests fail, see "Getting Help" on page 185.

Troubleshooting a Damaged System

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Open the system. See "Opening the System" on page 90.

2 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

3 Ensure that the following components are properly installed. See "Installing System Components" on page 83.

- Expansion cards
- Power supplies

- Fans
- Processors and heat sinks
- Memory modules
- Hard-drive carriers

4 Ensure that all cables are properly connected.

5 Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.

6 Close the system. See "Closing the System" on page 91.

7 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

8 Run the system board tests in the embedded system diagnostics. See "Running the Embedded System Diagnostics" on page 174.

If the tests fail, see "Getting Help" on page 185.

Troubleshooting the System Battery

NOTE: If the system is turned off for long periods of time (for weeks or months), the NVRAM may lose its system configuration information. This situation is caused by a defective battery.

1 Re-enter the time and date through the System Setup program. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

2 Turn off the system and disconnect it from the electrical outlet for at least one hour.

3 Reconnect the system to the electrical outlet and turn on the system.

4 Enter the System Setup program.

If the date and time are not correct in the System Setup program, replace the battery. See "System Battery" on page 139.

If the problem is not resolved by replacing the battery, see "Getting Help" on page 185.

NOTE: Some software may cause the system time to speed up or slow down. If the system seems to operate normally except for the time kept in the System Setup program, the problem may be caused by software rather than by a defective battery.

Troubleshooting Power Supplies

1 Identify the faulty power supply by the power supply's fault indicator. See "Power Indicator Codes" on page 23.

CAUTION: At least one power supply must be installed for the system to operate. Operating the system with only one power supply installed for extended periods of time can cause the system to overheat.

2 Reseat the power supply by removing and reinstalling it. See "Power Supplies" on page 121.

NOTE: After installing a power supply, allow several seconds for the system to recognize the power supply and to determine if it is working properly. The power indicator turns green to signify that the power supply is functioning properly.

If the problem persists, replace the faulty power supply.

3 If the problem persists, see "Getting Help" on page 185.

Troubleshooting System Cooling Problems

Ensure that none of the following conditions exist:

- System cover, cooling shroud, drive blank, or front or back filler panel is removed.
- Ambient temperature is too high.
- External airflow is obstructed.
- Cables inside the system obstruct airflow.
- An individual cooling fan is removed or has failed. See "Troubleshooting a Fan" on page 161.

Troubleshooting a Fan

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Locate the faulty fan indicated by the LCD panel or the diagnostic software.

2 Turn off the system and all attached peripherals.

3 Open the system. See "Opening the System" on page 90.

4 Reseat the fan's power cable.

5 Restart the system.

If the fan functions properly, close the system. See "Closing the System" on page 91.

6 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

7 If the fan does not function, turn off the system and install a new fan. See "Installing the System Fan" on page 135.

8 Restart the system.

If the problem is resolved, close the system. See "Closing the System" on page 91.

If the replacement fan does not operate, see "Getting Help" on page 185.

Troubleshooting System Memory

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 If the system is operational, run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

If diagnostics indicates a fault, follow the corrective actions provided by the diagnostic program.

2 Turn off the system and attached peripherals, and unplug the system from the power source. Press the power button with the system unplugged, and then reconnect the system to power.

3 Turn on the system and attached peripherals and note the messages on the screen.

Go to step 14 if an error message appears indicating a fault with a specific memory module.

4 Enter the System Setup program and check the system memory setting. See "Memory Settings Screen" on page 65. Make any changes to the memory settings, if needed.

   If the memory settings match the installed memory but a problem is still indicated, go to step 14.

5 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

6 Open the system. See "Opening the System" on page 90.

7 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

8 Check the memory banks and ensure that they are populated correctly. See "General Memory Module Installation Guidelines" on page 106.

9 Reseat the memory modules in their sockets. See "Installing Memory Modules" on page 110.

10 Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.

11 Close the system. See "Closing the System" on page 91.

12 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

13 Enter the System Setup program and check the system memory setting. See "Memory Settings Screen" on page 65.

   If the problem is not resolved, proceed with the next step.

14 Turn off the system and attached peripherals, and disconnect the system from the power source.

15 Open the system. See "Opening the System" on page 90.

16 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

17 If a diagnostic test or error message indicates a specific memory module as faulty, swap or replace the module.

18 To troubleshoot an unspecified faulty memory module, replace the memory module in the first DIMM socket with a module of the same type and capacity. See "Installing Memory Modules" on page 110.

19 Replace the cooling shroud. See "Removing the Cooling Shroud" on page 92.

20 Close the system. See "Closing the System" on page 91.

21 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

22 As the system boots, observe any error message that appears and the diagnostic indicators on the front of the system.

23 If the memory problem is still indicated, repeat step 14 through step 22 for each memory module installed.

If the problem persists after all memory modules have been checked, see "Getting Help."

Troubleshooting an Internal USB Key

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Enter the System Setup program and ensure that the USB key port is enabled. See "Integrated Devices Screen."

2 Turn off the system and attached peripherals.

3 Open the system. See "Opening the System."

4 Locate the USB key and reseat it. See "Internal USB Memory Key" on page 125.

5 Close the system. See "Closing the System" on page 91.

6 Turn on the system and attached peripherals and check if the USB key is functioning.

If the problem is not resolved, proceed with the next step.

7 Repeat step 2 and step 3.

8 Insert a different USB key that you know works properly.

9 Close the system. See "Closing the System" on page 91.

10 Turn on the system and attached peripherals and check if the USB key is functioning.

11 Reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem is not resolved, see "Getting Help."

Troubleshooting an Optical Drive

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Try using a different CD or DVD.

2 Enter the System Setup program and ensure that the drive's controller is enabled. See "Using the System Setup Program Navigation Keys" on page 62.

3 Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

4 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

If the problem is not resolved, proceed with the next step.

5 Open the system. See "Opening the System" on page 90.

6 Ensure that the interface cable is securely connected to the optical drive and to the controller.

7 Ensure that a power cable is properly connected to the drive.

8 Close the system. See "Closing the System" on page 91.

9 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem is not resolved, see "Getting Help" on page 185.

Troubleshooting an External Tape Drive

1. Try using a different tape cartridge.
2. Ensure that the device drivers for the tape drive are installed and are configured correctly. See your tape drive documentation for more information about device drivers.
3. Reinstall the tape-backup software as instructed in the tape-backup software documentation.
4. Ensure that the tape drive's interface cable is fully connected to the tape drive and the external port on the controller card.
5. For SCSI tape drives, verify that the tape drive is configured for a unique SCSI ID number and that the tape drive is terminated or not terminated, based on the interface cable used to connect the drive.

   See the documentation for the tape drive for instructions on selecting the SCSI ID number and enabling or disabling termination.
6. Run the appropriate diagnostics tests. See "Running the System Diagnostics" on page 173.
7. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

8. Open the system. See "Opening the System" on page 90.
9. Reseat the controller card in the expansion card slot.
10. Close the system. See "Closing the System" on page 91.
11. Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

    If the problem is not resolved, see the documentation for the tape drive for additional troubleshooting instructions.

    If you cannot resolve the problem, see "Getting Help" on page 185.

Troubleshooting a Hard Drive

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

CAUTION: This troubleshooting procedure can destroy data stored on the hard drive. Before you proceed, back up all files on the hard drive.

1. Run the appropriate diagnostics test. See "Running the System Diagnostics" on page 173.

   Depending on the results of the diagnostics test, proceed as needed through the following steps.

2. If your system has a SAS RAID controller and your hard drives are configured in a RAID array, perform the following steps.

   a. Restart the system and press <Ctrl><R> to enter the host adapter configuration utility program.

      See the documentation supplied with the host adapter for information about the configuration utility.

   b. Ensure that the hard drive(s) have been configured correctly for the RAID array.

   c. Exit the configuration utility and allow the system to boot to the operating system.

3. Ensure that the required device drivers for your controller card are installed and are configured correctly. See the operating system documentation for more information.

4. Restart the system, enter the System Setup program, and verify that the controller is enabled and the drives appear in the System Setup program. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

5. Check the cable connections inside the system:

   a. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

   b. Open the system. See "Opening the System" on page 90.

c Verify that the cable connections between the hard drive(s) and the drive controller are correct and that the cables are securely seated in their connectors.

d Close the system. See "Closing the System" on page 91.

e Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem persists, see "Getting Help" on page 185.

Troubleshooting a SAS or SAS RAID Controller

NOTE: When troubleshooting a SAS or SAS RAID controller, also see the documentation for your operating system and the controller.

1 Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

2 Enter the System Setup program and ensure that the SAS or SAS RAID controller is enabled. See "Using the System Setup Program and UEFI Boot Manager" on page 61.

3 Restart the system and press the applicable key sequence to enter the configuration utility program:

- <Ctrl><C> for a SAS controller
- <Ctrl><R> for a SAS RAID controller

See the controller's documentation for information about configuration settings.

4 Check the configuration settings, make any necessary corrections, and restart the system.

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

5 Turn off the system and attached peripherals, and disconnect the system from its electrical outlet.

6 Open the system. See "Opening the System" on page 90.

7 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

8 Ensure that the controller card is firmly seated into the system board connector. See "Installing an Expansion Card" on page 115.

9 If you have a SAS RAID controller, ensure that the following RAID components are properly installed and connected:

- Memory module
- Battery

If you have a SAS backplane, verify that the cable connections between the SAS backplane and the SAS controller are correct. Ensure that the cables are firmly connected to the SAS controller and the SAS backplane board.

10 Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.

11 Close the system. See "Closing the System" on page 91.

12 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

If the problem persists, see "Getting Help" on page 185.

Troubleshooting Expansion Cards

NOTE: When troubleshooting an expansion card, see the documentation for your operating system and the expansion card.

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1 Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

2 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

3 Open the system. See "Opening the System" on page 90.

4 Ensure that each expansion card is firmly seated in its connector. See "Installing an Expansion Card" on page 115.

5 Close the system. See "Closing the System" on page 91.

6 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

7 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

   If the problem is not resolved, proceed with the next step.

8 Open the system. See "Opening the System" on page 90.

9 Remove all expansion cards installed in the system. See "Removing an Expansion Card" on page 118.

10 Close the system. See "Closing the System" on page 91.

11 Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

12 Run the appropriate diagnostic test. See "Running the System Diagnostics" on page 173.

   If the tests fail, see "Getting Help" on page 185.

13 For each expansion card you removed in step 9, perform the following steps:

   a Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

   b Open the system. See "Opening the System" on page 90.

   c Reinstall one of the expansion cards.

   d Close the system. See "Closing the System" on page 91.

   e Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

   f Run the appropriate diagnostic test. See "Running the Embedded System Diagnostics" on page 174.

      If the tests fail, see "Getting Help" on page 185.

Troubleshooting the Processors

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

1. Run the appropriate diagnostics test. See "Running the System Diagnostics" on page 173.
2. Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
3. Open the system. See "Opening the System" on page 90.
4. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.
5. Ensure that each processor and heat sink are properly installed. See "Installing a Processor" on page 138.
6. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
7. Close the system. See "Closing the System" on page 91.
8. Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.
9. Run the appropriate diagnostic test. See "Running the Embedded System Diagnostics."

   If your system only has one processor and a problem is still indicated, see "Getting Help" on page 185.
10. For systems with multiple processors, turn off the system and attached peripherals, and disconnect the system from the electrical outlet.
11. Open the system. See "Opening the System" on page 90.
12. Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.
13. Remove all processors except for processor 1. See "Removing a Processor" on page 135.
14. Replace the cooling shroud. See "Installing the Cooling Shroud" on page 93.
15. Close the system. See "Closing the System" on page 91.
16. Place the system upright and on its feet on a flat and stable surface, reconnect the system to the electrical outlet, and turn on the system and attached peripherals.

17 Run the appropriate diagnostic test. See "Running the Embedded System Diagnostics."

If the test fails, the processor is faulty. See "Getting Help" on page 185.

18 Turn off the system and attached peripherals, and disconnect the system from the electrical outlet.

19 Open the system. See "Opening the System" on page 90.

20 Remove the cooling shroud. See "Removing the Cooling Shroud" on page 92.

21 Replace processor 1 with processor 2. See "Processors" on page 135.

22 Repeat step 15 through step 17.

If your system has more than two processors, continue installing and testing each processor in the processor 1 slot until you determine the faulty processor, and then replace the faulty processor. See "Getting Help" on page 185.

If you have tested all the processors and the problem persists, the system board is faulty. See "Getting Help" on page 185.

5

Running the System Diagnostics

If you experience a problem with your system, run the diagnostics before calling for technical assistance. The purpose of the diagnostics is to test your system's hardware without requiring additional equipment or risking data loss. If you are unable to fix the problem yourself, service and support personnel can use diagnostics test results to help you solve the problem.

Using Dell™ Diagnostics

To assess a system problem, first use the Online Diagnostics. Dell Online Diagnostics is a suite of diagnostic programs, or test modules, that include diagnostic tests on chassis and storage components such as hard drives, physical memory, communications and printer ports, NICs, CMOS, and more. If you are unable to identify the problem using the Online Diagnostics, then use the embedded system diagnostics.

The files required to run Online Diagnostics for systems running supported Microsoft® Windows® and Linux operating systems are available at **support.dell.com** and on the DVDs that came with your system. For information about using diagnostics, see the *Dell Online Diagnostics User's Guide*.

The embedded system diagnostics can be launched using Unified Server Configurator (USC). For more information about using USC, see the *Dell Unified Server Configurator User's Guide* on the Dell Support website at **support.dell.com/manuals**.

Embedded System Diagnostics Features

The embedded system diagnostics provides a series of menus and options for particular device groups or devices. The system diagnostics menus and options allow you to:

- Run tests individually or collectively
- Control the sequence of tests
- Repeat tests

- Display, print, or save test results
- Temporarily suspend testing if an error is detected or terminate testing when a user-defined error limit is reached
- View help messages that briefly describe each test and its parameters
- View status messages that inform you if tests are completed successfully
- View error messages that inform you of problems encountered during testing

When to Use the Embedded System Diagnostics

If a major component or device in the system does not operate properly, component failure may be indicated. As long as the microprocessor and the system's input/output devices are functioning, you can use the system diagnostics to help identify the problem.

Running the Embedded System Diagnostics

CAUTION: Use the system diagnostics to test only your system. Using this program with other systems may cause invalid results or error messages.

1. As the system boots, press <F10>.
2. Click **Diagnostics** in the left pane and click **Launch Diagnostics** in the right pane.

The **Diagnostics** menu allows you to run all or specific diagnostics tests or to exit.

Embedded System Diagnostics Testing Options

Click the testing option in the **Main Menu** window.

Testing Option	Function
Express Test	Performs a quick check of the system. This option runs device tests that do not require user interaction.
Extended Test	Performs a more thorough check of the system. This test can take an hour or longer.

Testing Option	Function
Custom Test	Tests a particular device.
Information	Displays test results.

Using the Custom Test Options

When you select **Custom Test** in the **Main Menu** window, the **Customize** window allows you to select the device(s) to be tested, select specific options for testing, and view the test results.

Selecting Devices for Testing

The left side of the **Customize** window lists devices that can be tested. Click the (+) next to a device or module to view its components. Click (+) on any component to view the tests that are available. Clicking a device, rather than its components, selects all of the components of the device for testing.

NOTE: After you select all the devices and components that you want to test, highlight **All Devices** and then click **Run Tests**.

Selecting Diagnostics Options

From the **Diagnostics Options** area, select the test(s) you want to run on a device.

- **Non-Interactive Tests Only** — Runs only tests that require no user intervention.
- **Quick Tests Only** — Runs only the quick tests on the device.
- **Show Ending Timestamp** — Time stamps the test log.
- **Test Iterations** — Selects the number of times the test is run.
- **Log output file pathname** — Enables you to specify the diskette drive or USB memory key where the test log file is saved. You cannot save the file to a hard drive.

Viewing Information and Results

The following tabs in the **Customize** window provide information about the test and the test results.

- **Results** — Displays the test that ran and the result.
- **Errors** — Displays any errors that occurred during the test.
- **Help** — Displays information about the currently selected device, component, or test.
- **Configuration** — Displays basic configuration information about the currently selected device.
- **Parameters** — Displays parameters that you can set for the test.

6

Jumpers and Connectors

WARNING: Only trained service technicians are authorized to remove the system cover and access any of the components inside the system. Before you begin this procedure, review the safety instructions that came with the system.

System Board Jumpers

For information on resetting the password jumper to disable a password, see "Disabling a Forgotten Password" on page 183.

Table 6-1. System Board Jumper Settings

Jumper	Setting	Description
PWRD_EN	(default)	The password feature is enabled (pins 2-4)
		The password feature is disabled, and iDRAC6 local access is unlocked at the next AC power cycle (pins 4-6)
NVRAM_CLR	(default)	The configuration settings are retained at system boot (pins 3-5)
		The configuration settings are cleared at the next system boot (pins 1-3)

System Board Connectors

Figure 6-1. System Board Jumpers and Connectors

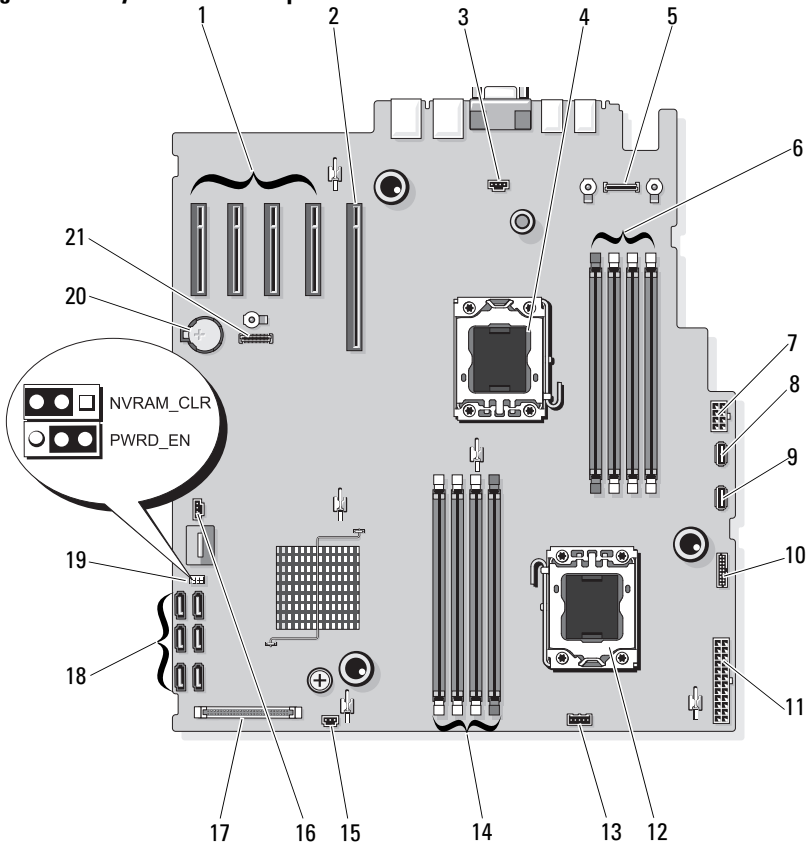


Table 6-2. System Board Jumpers and Connectors

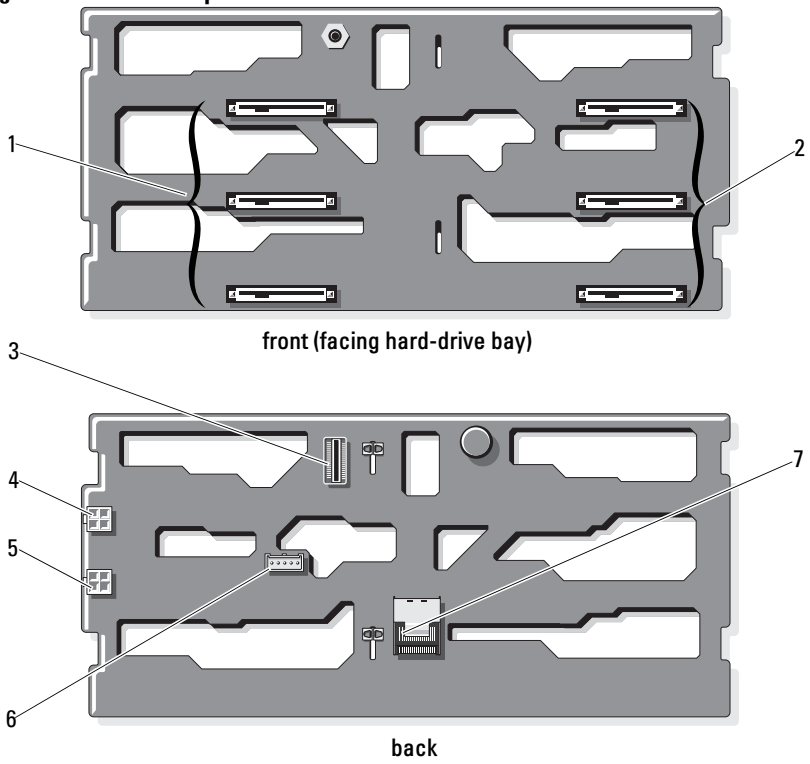
Item	Connector	Description
1	PCIE_G2_X4	PCIe connector x4 (slot 1)
	PCIE_G2_X4	PCIe connector x4 (slot 2)
	PCIE_G1_X4	PCIe connector x4 (slot 3)
	PCIE_G2_X4	PCIe connector x4 (slot 4)
2	PCIE_G2_X8	PCIe connector x8 (slot 5)
3	FAN	System fan connector
4	CPU2	Processor 2
5	iDRAC6 Enterprise	iDRAC 6 Enterprise card connector
6	B3	Memory module slot B3 (white release lever)
	B2	Memory module slot B2 (white release lever)
	B1	Memory module slot B1 (white release lever)
	B4	Memory module slot B4
7	12V	8 pin power connector
8	INT_USB1	Internal USB module connector 1
9	INT_USB 2	Internal USB module connector 2
10	PDB_CONN	Power distribution board power connector
11	PWR_CONN	24 pin power connector
12	CPU1	Processor 1
13	BP_I2C	Backplane I2C connector
14	A3	Memory module slot A3 (white release lever)
	A2	Memory module slot A2 (white release lever)
	A1	Memory module slot A1 (white release lever)
	A4	Memory module slot A4
15	INTRUSION	Chassis intrusion switch connector
16	HD_ACT_CARD	Hard drive activity connector
17	CTRL_PNL	Control panel connector

Table 6-2. System Board Jumpers and Connectors

Item	Connector	Description
18	SATA_A	SATA connector A
	SATA_B	SATA connector B
	SATA_C	SATA connector C
	SATA_D	SATA connector D
	SATA_E	SATA connector E
	SATA_F	SATA connector F
19	PWRD_EN	Password enable jumper
	NVRM_CLR	NVRAM clear jumper
20	BATTERY	System battery
21	iDRAC6 Express	iDRAC6 Express card connector

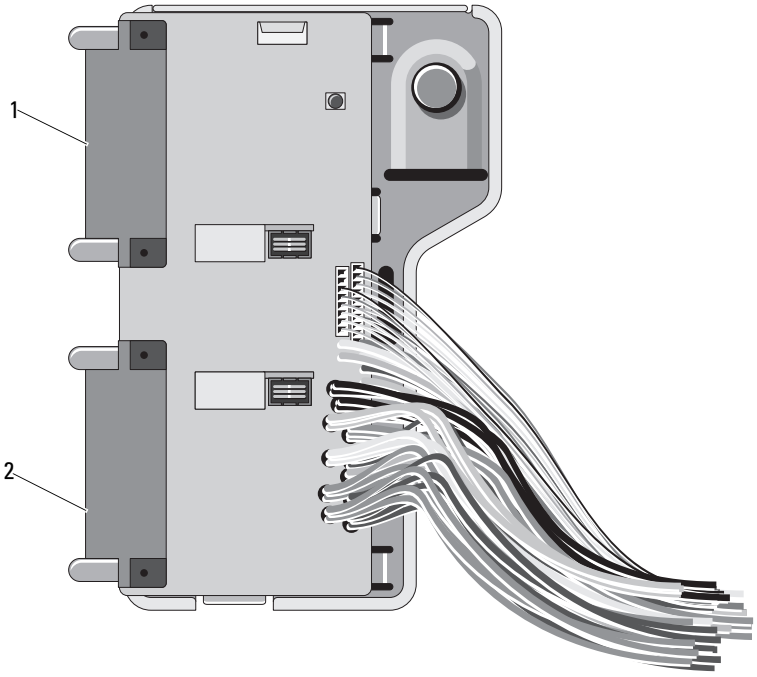
SAS Backplane Board Connectors

Figure 6-2. SAS Backplane Board Connectors



1	hard drive connectors 0–2	2	hard drive connectors 3–5
3	J_SAS_B cable connector	4	P4 power connector
5	P3 power connector	6	J_PLANAR_BMC cable connector
7	J_SAS_A cable connector		

Power Distribution Board Connectors



1 J_PWR1 connector

2 J_PWR2 connector

Disabling a Forgotten Password

The system's software security features include a system password and a setup password, which are discussed in detail in "Using the System Setup Program." The password jumper enables these password features or disables them and clears any password(s) currently in use.

CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions that came with the system.

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system. See "Opening and Closing the System" on page 90.
3. Remove the jumper plug from the password jumper.

   See Figure 6-1 to locate the password jumper (labeled "PWRD_EN") on the system board.
4. Close the system. See "Opening and Closing the System" on page 90.
5. Reconnect your system and peripherals to their electrical outlets, and turn on the system.

   The existing passwords are not disabled (erased) until the system boots with the password jumper plug removed. However, before you assign a new system and/or setup password, you must install the jumper plug.

   NOTE: If you assign a new system and/or setup password with the jumper plug still removed, the system disables the new password(s) the next time it boots.
6. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
7. Open the system. See "Opening and Closing the System" on page 90.
8. Install the jumper plug on the password jumper.
9. Close the system.
10. Reconnect your system and peripherals to their electrical outlets, and turn on the system.
11. Assign a new system and/or setup password.

    To assign a new password using the System Setup program, see "Assigning a System Password" on page 77.

7

Getting Help

Contacting Dell

For customers in the United States, call 800-WWW-DELL (800-999-3355).

NOTE: If you do not have an active Internet connection, you can find contact information on your purchase invoice, packing slip, bill, or Dell product catalog.

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical support, or customer service issues:

1. Visit **support.dell.com**.
2. Verify your country or region in the **Choose A Country/Region** drop-down menu at the bottom of the page.
3. Click **Contact Us** on the left side of the page.
4. Select the appropriate service or support link based on your need.
5. Choose the method of contacting Dell that is convenient for you.

Glossary

A — Ampere(s).

AC — Alternating current.

ACPI — Advanced Configuration and Power Interface. A standard interface for enabling the operating system to direct configuration and power management.

ambient temperature — The temperature of the area or room where the system is located.

ANSI — American National Standards Institute. The primary organization for developing technology standards in the U.S.

asset tag — An individual code assigned to a system, usually by an administrator, for security or tracking purposes.

backup — A copy of a program or data file. As a precaution, back up your system's hard drive(s) on a regular basis.

blade — A module that contains a processor, memory, and a hard drive. The modules are mounted into a chassis that includes power supplies and fans.

BMC — Baseboard management controller.

bootable media — A CD, diskette, or USB memory key that is used to start your system if the system will not boot from the hard drive.

BTU — British thermal unit.

bus — An information pathway between the components of a system. Your system contains an expansion bus that allows the processor to communicate with controllers for the peripheral devices connected to the system. Your system also contains an address bus and a data bus for communications between the processor and RAM.

C — Celsius.

cache — A fast storage area that keeps a copy of data or instructions for quick data retrieval.

cm — Centimeter(s).

COMn — The device names for the serial ports on your system.

control panel — The part of the system that contains indicators and controls, such as the power button and power indicator.

controller — A chip or expansion card that controls the transfer of data between the processor and memory or between the processor and a peripheral device.

coprocessor — A chip that relieves the system's processor of specific processing tasks. A math coprocessor, for example, handles numeric processing.

CPU — Central processing unit. See *processor*.

DC — Direct current.

DDR — Double-data rate. A technology in memory modules that potentially doubles the data rate by transferring data on both the rising and falling pulses of a clock cycle.

device driver — A program that allows the operating system or some other program to interface correctly with a peripheral.

DHCP — Dynamic Host Configuration Protocol. A method of automatically assigning an IP address to a client system.

diagnostics — A comprehensive set of tests for your system.

DIMM — Dual in-line memory module. See also *memory module*.

DNS — Domain Name System. A method of translating Internet domain names, such as **www.example.com**, into IP addresses, such as 208.77.188.166.

DRAM — Dynamic random-access memory. A system's RAM is usually made up entirely of DRAM chips.

driver — See *device driver*.

DVD — Digital versatile disc or digital video disc.

ECC — Error checking and correction.

EMI — Electromagnetic interference.

ERA — Embedded remote access. ERA allows you to perform remote, or "out-of-band," server management on your network server using a remote access controller.

ESD — Electrostatic discharge.

ESM — Embedded server management.

expansion bus — Your system contains an expansion bus that allows the processor to communicate with controllers for peripherals, such as NICs.

expansion card — An add-in card, such as a NIC or SCSI adapter, that plugs into an expansion-card connector on the system board. An expansion card adds some specialized function to the system by providing an interface between the expansion bus and a peripheral.

expansion-card connector — A connector on the system board or riser board for plugging in an expansion card.

F — Fahrenheit.

FAT — File allocation table. The file system structure used by MS-DOS® to organize and keep track of file storage. The Microsoft® Windows® operating systems can optionally use a FAT file system structure.

Fibre Channel — A high-speed network interface used primarily with networked

storage devices.

flash memory — A type of electronic chip that can be programmed and reprogrammed using a software utility.

FSB — Front-side bus. The FSB is the data path and physical interface between the processor and the main memory (RAM).

FTP — File transfer protocol.

g — Gram(s).

G — Gravities.

Gb — Gigabit(s); 1024 megabits or 1,073,741,824 bits.

GB — Gigabyte(s); 1024 megabytes or 1,073,741,824 bytes. However, when referring to hard-drive capacity, the term is usually rounded to 1,000,000,000 bytes.

graphics mode — A video mode that can be defined as *x* horizontal by *y* vertical pixels by *z* colors.

host adapter — A controller that implements communication between the system's bus and the peripheral device, typically a storage device.

hot-swap — The ability to insert or install a device, typically a hard drive or an internal cooling fan, into the host system while the system is powered on and running.

Hz — Hertz.

I/O — Input/output. A keyboard is an input device, and a monitor is an output device. In general, I/O activity can be differentiated from computational activity.

IDE — Integrated drive electronics. A standard interface between the system board and storage devices.

iDRAC — Internet Dell Remote Access Controller. A remote access controller that uses the Internet SCSI protocol.

IP — Internet Protocol.

IPv6 — Internet Protocol version 6.

IPX — Internet package exchange.

IRQ — Interrupt request. A signal that data is about to be sent to or received by a peripheral device travels by an IRQ line to the processor. Each peripheral connection must be assigned an IRQ number. Two devices can share the same IRQ assignment, but you cannot operate both devices simultaneously.

iSCSI — Internet SCSI (see *SCSI*). A protocol that enables SCSI device communication across a network or the Internet.

jumper — Small blocks on a circuit board with two or more pins emerging from them. Plastic plugs containing a wire fit down over the pins. The wire connects the pins and

creates a circuit, providing a simple and reversible method of changing the circuitry in a board.

K — Kilo-; 1000.

Kb — Kilobit(s); 1024 bits.

KB — Kilobyte(s); 1024 bytes.

Kbps — Kilobit(s) per second.

KBps — Kilobyte(s) per second.

kg — Kilogram(s); 1000 grams.

kHz — Kilohertz.

KVM — Keyboard/video/mouse. KVM refers to a switch that allows selection of the system from which the video is displayed and for which the keyboard and mouse are used.

LAN — Local area network. A LAN is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

LCD — Liquid crystal display.

LED — Light-emitting diode. An electronic device that lights up when a current is passed through it.

LGA — Land grid array.

local bus — On a system with local-bus expansion capability, certain peripheral devices (such as the video adapter circuitry) can be designed to run much faster than they would with a traditional expansion bus. See also *bus*.

LOM — LAN on motherboard.

LVD — Low voltage differential.

m — Meter(s).

mA — Milliampere(s).

MAC address — Media Access Control address. Your system's unique hardware number on a network.

mAh — Milliampere-hour(s).

Mb — Megabit(s); 1,048,576 bits.

MB — Megabyte(s); 1,048,576 bytes. However, when referring to hard-drive capacity, the term is often rounded to mean 1,000,000 bytes.

Mbps — Megabits per second.

MBps — Megabytes per second.

MBR — Master boot record.

memory address — A specific location, usually expressed as a hexadecimal number, in the system's RAM.

memory module — A small circuit board containing DRAM chips that connects to the system board.

memory — An area in your system that stores basic system data. A system can contain several different forms of memory, such as integrated memory (ROM and RAM) and add-in memory modules (DIMMs).

memory key — A portable flash memory storage device integrated with a USB connector.

MHz — Megahertz.

mirroring — A type of data redundancy in which a set of physical drives stores data and one or more sets of additional drives stores duplicate copies of the data. Mirroring functionality is provided by software. See also *striping* and *RAID*.

mm — Millimeter(s).

ms — Millisecond(s).

NAS — Network Attached Storage. NAS is one of the concepts used for implementing shared storage on a network. NAS systems have their own operating systems, integrated hardware, and software that are optimized to serve specific storage needs.

NIC — Network interface controller. A device that is installed or integrated in a system to allow connection to a network.

NMI — Nonmaskable interrupt. A device sends an NMI to signal the processor about hardware errors.

ns — Nanosecond(s).

NVRAM — Nonvolatile random-access memory. Memory that does not lose its contents when you turn off your system. NVRAM is used for maintaining the date, time, and system configuration information.

parity — Redundant information that is associated with a block of data.

parity stripe — In RAID arrays, a striped hard drive containing parity data.

partition — You can divide a hard drive into multiple physical sections called *partitions* with the **fdisk** command. Each partition can contain multiple logical drives. You must format each logical drive with the **format** command.

PCI — Peripheral Component Interconnect. A standard for local-bus implementation.

PDU — Power distribution unit. A power source with multiple power outlets that provides electrical power to servers and storage systems in a rack.

peripheral — An internal or external device, such as a diskette drive or keyboard, connected to a system.

pixel — A single point on a video display. Pixels are arranged in rows and columns to create an image. A video resolution, such as 640 x 480, is expressed as the number of pixels across by the number of pixels up and down.

POST — Power-on self-test. Before the operating system loads when you turn on your system, the POST tests various system components such as RAM and hard drives.

processor — The primary computational chip inside the system that controls the interpretation and execution of arithmetic and logic functions. Software written for one processor must usually be revised to run on another processor. *CPU* is a synonym for processor.

PXE — Preboot eXecution Environment. A way of booting a system via a LAN (without a hard drive or bootable diskette).

RAC — Remote access controller.

RAID — Redundant array of independent disks. A method of providing data redundancy. Some common implementations of RAID include RAID 0, RAID 1, RAID 5, RAID 10, and RAID 50. See also *mirroring* and *striping*.

RAM — Random-access memory. The system's primary temporary storage area for program instructions and data. Any information stored in RAM is lost when you turn off your system.

R-DIMM — A registered DDR3 memory module.

readme file — A text file, usually shipped with software or hardware, that contains information supplementing or updating the product's documentation.

read-only file — A read-only file is one that you are prohibited from editing or deleting.

ROM — Read-only memory. Your system contains some programs essential to its operation in ROM code. A ROM chip retains its contents even after you turn off your system. Examples of code in ROM include the program that initiates your system's boot routine and the POST.

ROMB — RAID on motherboard.

SAN — Storage Area Network. A network architecture that enables remote network-attached storage devices to appear to a server to be locally attached.

SAS — Serial-attached SCSI.

SATA — Serial Advanced Technology Attachment. A standard interface between the system board and storage devices.

SCSI — Small computer system interface. An I/O bus interface with faster data

transmission rates than standard ports.

SD card — Secure digital flash memory card.

SDRAM — Synchronous dynamic random-access memory.

sec — Second(s).

serial port — A legacy I/O port with a 9-pin connector that transfers data one bit at a time and is most often used to connect a modem to the system.

service tag — A bar code label on the system used to identify it when you call Dell for technical support.

SMART — Self-Monitoring Analysis and Reporting Technology. Allows hard drives to report errors and failures to the system BIOS and then display an error message on the screen.

SMP — Symmetric multiprocessing. Used to describe a system that has two or more processors connected via a high-bandwidth link and managed by an operating system, where each processor has equal access to I/O devices.

SNMP — Simple Network Management Protocol. A standard interface that allows a network manager to remotely monitor and manage workstations.

striping — Disk striping writes data across three or more disks in an array, but only uses a portion of the space on each disk. The amount of space used by a "stripe" is the same on each disk used. A virtual disk may use several stripes on the same set of disks in an array. See also *guarding*, *mirroring*, and *RAID*.

SVGA — Super video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

system board — As the main circuit board, the system board usually contains most of your system's integral components, such as the processor(s), RAM, controllers for peripherals, and various ROM chips.

system configuration information — Data stored in memory that tells a system what hardware is installed and how the system should be configured for operation.

system memory — See *RAM*.

System Setup program — A BIOS-based program that allows you to configure your system's hardware and customize the system's operation by setting features such as password protection. Because the System Setup program is stored in NVRAM, any settings remain in effect until you change them again.

TCP/IP — Transmission Control Protocol/Internet Protocol.

termination — Some devices (such as the last device at each end of a SCSI cable) must be terminated to prevent reflections and spurious signals in the cable. When such devices are connected in a series, you may need to enable or disable the

termination on these devices by changing jumper or switch settings on the devices or by changing settings in the configuration software for the devices.

TOE — TCP/IP offload engine.

U-DIMM — An unregistered (unbuffered) DDR3 memory module.

uplink port — A port on a network hub or switch used to connect to other hubs or switches without requiring a crossover cable.

UPS — Uninterruptible power supply. A battery-powered unit that automatically supplies power to your system in the event of an electrical failure.

USB — Universal Serial Bus. A USB connector provides a single connection point for multiple USB-compliant devices, such as mice and keyboards. USB devices can be connected and disconnected while the system is running.

USB memory key — See *memory key*.

utility — A program used to manage system resources—memory, disk drives, or printers, for example.

V — Volt(s).

VAC — Volt(s) alternating current.

VDC — Volt(s) direct current.

VGA — Video graphics array. VGA and SVGA are video standards for video adapters with greater resolution and color display capabilities than previous standards.

video adapter — The logical circuitry that provides (in combination with the monitor) your system's video capabilities. A video adapter may be integrated into the system board or may be an expansion card that plugs into an expansion slot.

video memory — Most VGA and SVGA video adapters include memory chips in addition to your system's RAM. The amount of video memory installed primarily influences the number of colors that a program can display (with the appropriate video drivers and monitor capabilities).

video resolution — Video resolution (800 x 600, for example) is expressed as the number of pixels across by the number of pixels up and down. To display a program at a specific graphics resolution, you must install the appropriate video drivers and your monitor must support the resolution.

virtualization — The ability via software to share the resources of a single computer across multiple environments. A single physical system may appear to the user as multiple virtual systems able to host multiple operating systems.

W — Watt(s).

WH — Watt-hour(s).

XML — Extensible Markup Language. XML is a way to create common information formats and to share both the format and the data on the World Wide Web, intranets, and elsewhere.

ZIF — Zero insertion force.

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